The International Journal of
Orthodontia, Oral Surgery and Radiography

(All rights reserved)

VOL. XVII ST. LOUIS, JULY, 1931 No. 7

ORIGINAL ARTICLES

PRESIDENT'S ADDRESS*

BY CARLTON B. MOTT, D.D.S., ASHEVILLE, N. C.

THE honor, which you, my dear members of the Southern Society, have bestowed on me as President, carries with it the blessed privilege of being with you again, and renewing the friendships which have meant so much to me, with particular reference to the meeting in Asheville when during my illness you were so generously and genuinely kind and sympathetic. I feel grateful for the helpful contacts with our former officers and their untiring work in research and experience, and trust my obligations to carry on may grow with my interest in, and love of this wonderful work.

We owe our founders a debt of gratitude for their keen vision in the development of our specialty and for their labors in the advancement of orthodontia.

We owe to the American Society of Orthodontists a debt of gratitude: First, for their work in the advancement of orthodontia as to progress in educational requirements, for foundation study, in the applicant for orthodontia; second, for their constant study in scientific research, a plea for a National Research Council, as the medical research worker with no thought of financial rewards, working happily in the interest of humanity; third, for their cooperative interest in each department of the work of the national organization to which we, as members of it, pledge our support.

Closer to our hearts and homes, we gratefully pledge our hearty support to our own Southern men who have given of themselves in time, money, and loyal work, and who have responded so splendidly to any call for service, and given to posterity knowledge and methods parallel to some of the early masters, gained by experience, work, and love of the profession.

*Read before the Southern Society of Orthodontists, Miami, Fla., Jan. 13, 14, 15, 1931.

With this honor as president is also given the trust and responsibility of the Southern Society, for a season. This is fully appreciated and any constructive work that has been done is due to the untiring efforts of my fellow-officers, and the willing response of those who will make this meeting a success.

In this message to you, my heart and mind are so full it is hard to know how to begin or where to leave off. Orthodontia being a comparatively new specialty, rapid strides have been made as to education and research, business and policies in regard to the profession. Methods are being worked out in such a way as best to serve Nature in the development of the child as an individual. The confidence and the interest of the patient are easily obtained. We are all vain, and to be normal appeals to the child; he or she is consulted, treated as an individual, allowed to observe the defect, and shown how the orthodontist can assist Nature in restoring a normal condition.

Now, due to the apparent and increasing evidence of social unrest and revolution throughout the world, requiring a necessity for a readjustment to new economic conditions which is being definitely reflected in professional life, in the form of an economic stress such as we have never known before, please allow me to speak from experience in meeting this condition in my locality. The parent or parents are consulted and the work is started. But, should financial conditions bring about a distress in money matters the public is not educated to the real need of orthodontia. It is not always a case of "cannot pay" but if it means giving up a luxury, then the public does not realize the seriousness of the deformity or defect. It is not so with a broken bone, an illness, adenoids, or abnormal tonsils. These weaknesses are all necessarily righted. There is to my mind a lack of cooperation between the medical, dental and orthodontic practitioners. Our work has been and is being called a luxury. How best can we of the Southern Society of Orthodontists meet the need of the masses of children who should have our services, other than absolute charity? Unfortunately, we cannot have a satisfactory home life, so necessary as a background for a successful professional career, without a reasonable income.

Each of us has his real charity patients to care for. Those who can and should pay must pay, thereby the correction of malocclusion is counted a luxury, measured by money alone. We must in time educate the public to the crying need of a service so necessary, and one that gives such far-reaching results. We lack unity of thought on this problem. We think as individuals, as groups, as societies, as associations. We are only a small part of the great public. We must reach that public. They must be educated as to the need of the orthodontist's service.

My dream is that we shall have clinics all over this country. My firm belief is that this can be accomplished in unity of thought and combined effort on the part of the orthodontic profession. Let us work to this end so the masses may be educated, and there will be a firmer contact with men in other lines of professional service, that they may learn the helpful service of the orthodontists. The Southern Society can only be true to its name and lend

loyal support to any plan suggested for educational advancement for the practitioner and the public.

As a suggestion, please allow me to recommend that an Advisory Board be formed by this Society, and that each of the past presidents be elected a member of this Board. They should meet annually, at the same time and place as the regular Southern meeting. Their duties will be to consider and discuss all important questions arising, and a decision by the majority of the Board should be presented to the Society to be accepted or rejected by the majority of the members of the Society. My reason for this recommendation is prompted by the thought that the past presidents have had experience and information that will be of continued value to the Society.

It has been a privilege to serve you the past year, and I pledge my support at all times, to the interest of the practice and progress of orthodontia. May we all be competent and happy orthodontists.

SOME STUDIES OF THE MOLAR AND PREMOLAR TEETH IN RELATION TO ANCHOR BAND CONSTRUCTION, ADAPTATION, AND THE HEALTH OF THE DENTAL TISSUES*

By Herbert A. Pullen, D.M.D., Buffalo, N. Y.

THE following of the direct method of adaptation of molar anchor bands and of the seamless bands in particular for a number of years has led me along some very interesting paths in the consideration of more exact forms which these anchor bands might be made to assume in their manufacture in order that they might conform more perfectly to the anatomy of the molar and premolar teeth and thus better preserve the surfaces of these anchor teeth and the health of the surrounding plastic tissues.

If the health of the hard tissues of the teeth and their surrounding soft tissues is not preserved by properly constructed anchor bands and appliances which do not injure these tissues, any orthodontic treatment is of little avail, or at least it is neglectful of one of the greatest factors in its success through leaving an aftermath of carious dental tissues or diseased soft tissues incapable of recovery from the effects of the initial inflammation caused by carelessly constructed anchor bands.

In the experience of every orthodontist the simpler the appliance and the more perfect conformation of its anchor bands to the surfaces of the anchor teeth without encroachment upon the soft tissues, the less interference there is with the normal function of the teeth and the tissues in which they are imbedded, and with the self-cleansing action of the fluids of the mouth, and the less likelihood there is of inflammation of these tissues.

The gradual disappearance of the clamp band with its projecting lingual screw and nut and the substitution of the plain band are the most classic example of the trend of modern orthodontia toward simplicity and perfection of form of anchor bands with an idea of noninterference with the health and function of the anchor tooth and its surrounding plastic tissues.

The general theme which I shall consciously or unconsciously follow throughout this series of studies of the first molar and a perfectly fitting anchor band therefore will be the preservation of the health of the dental tissues.

In the belief that a review of the anatomy of certain portions of the crowns of the molars and premolars may throw still more light on proper anchor band construction in relation to preserving the dental tissues through noninterference with soft tissues and nonoverlap of certain danger zones of the hard tissues of the teeth, let us take the tooth most frequently banded for anchorage, the first permanent molar, and point out these danger zones upon its various surfaces.

*Read before the Southern Society of Orthodontists, Jan. 12, 1931; The Great Lakes Society of Orthodontists, Feb. 17, 1931; The New York Society of Orthodontists, March 11, 1931.

Beginning with the left maxillary first molar, Fig. 1, we shall look at its various surfaces with an eye to the gingival and occlusal limitations of an anchor band planned in advance not to injure but to preserve the hard and soft tissues and to conform as nearly as possible with the anatomic form of the crown of the molar and to avoid the danger zones.

The mesial and distal surfaces of the left maxillary first molar, Fig. 1, which are tracings from actual photographs, exhibit the variation in height of the cervical line and its irregularity. The gum septum is attached along these lines, and its free margins extend occlusally to the contact points. These mesial and distal surfaces beneath the gum septum, especially on account of their apical inclination, are distinct danger zones for the extension of the edges of either a tapered or cylindrical band.

From the mesial and distal aspects there may also be observed only a slight variation from the vertical plane to a taper of the buccal and lingual surfaces which is significant in the choice of the form of a band to fit these surfaces.

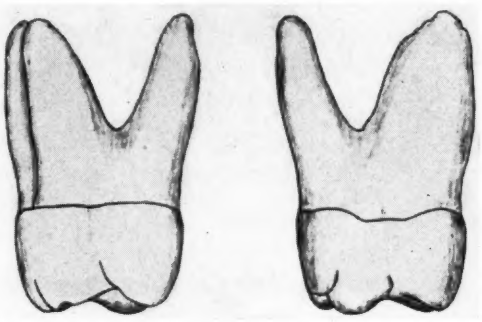


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1.—Distal and mesial surfaces of the maxillary left first molar.
Fig. 2.—Buccal and lingual surfaces of the maxillary left first molar.
Fig. 3.—Occlusal surface of maxillary left first molar.

Other danger zones in the overextension of the mesial and distal occlusal edges of an anchor band upon the mesial and distal marginal ridges to the occlusal surface of the molar exist on these mesial and distal surfaces.

The overlapping of the occlusal surface of the molar mesially and distally by the anchor band, as in Fig. 2, is a common fault. The overlapping of the occlusal surface by the anchor band both mesially and distally, and buccally and lingually, as in Fig. 3, is not uncommon.

Fig. 4 exhibits from the buccal and lingual aspects another maxillary first molar with the normal four cusps, a large number possessing five cusps. The buccal and lingual views show the apical convergence of the mesial and distal surfaces which is more than enough to offset the slight occlusal taper of the buccal and lingual surfaces, and which is suggestive of the possibility of a

cylindrical band being more nearly adapted to a conformation to these four surfaces than a band that is tapered.

The buccal and lingual surfaces present similar danger zones at the gingival line from the possible irritation of an anchor band that the mesial and distal surfaces present in the gum septum. Overextension of the buccal and lingual occlusal margins of an anchor band upon these surfaces may interfere with occlusion, or cause the band to be torn, bent, or loosened.

The occlusal surface of the maxillary first molar, Fig. 5, exhibits from this aspect the danger zones in anchor band overextension upon the mesial and distal marginal ridges which should not be encroached upon because of the flowing of the gold which overlaps under the stress of occlusion, and the consequent breaking up of the underlying cement and injury to the enamel.

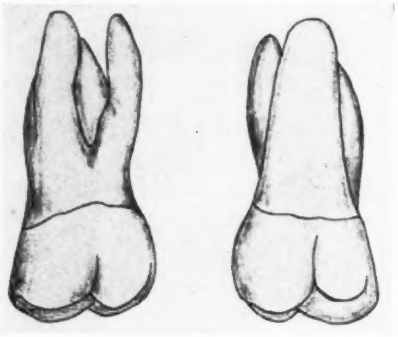


Fig. 4.

Fig. 5.

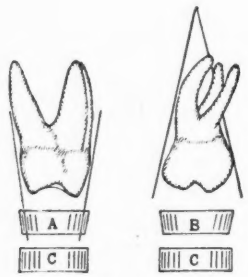


Fig. 6.

The occasional fifth cusp on the lingual surface observed in this illustration may be disregarded as interfering to any degree in a standardized band construction as applied to the first molar with four cusps.

In Fig. 2, the maxillary first molars exhibit extreme apical convergence of the mesial and distal surfaces looking at them from the buccal and lingual aspect. From the mesial and distal aspects, Fig. 1, there is only a slight taper of the buccal and lingual surfaces in the occlusal third of the first molars. The opposing of these surface planes is the first and most significant thing to be considered in the determination of the form of a closely fitting anchor band.

Having made the foregoing study of the various surfaces of the crown of the maxillary first permanent molar in relation to the danger zones in overextended or overlapping margins of anchor bands, let us consider next the relation of the planes of the buccal and lingual, and mesial and distal surfaces

to the form of anchor band suitable for the easiest adaptation to these surfaces with planes of opposing angles.

It is obvious that if a tapered or cone-shaped band similar to the one shown at *A*, Fig. 6, were placed upon the first molar above it, the taper of the band might conform to the buccal and lingual surfaces, but the taper would have to be reversed in the band *B* to conform to the apical taper of the molar above it on the mesial and distal surfaces. The cylindrical band, *C*, being a mean between the two tapered bands, offers a closer fitting band above the contact points than a tapered band. If a slightly tapered band were placed upon the maxillary first molar, the taper might follow that of the buccal and lingual surfaces of the tooth as at *D*, Fig. 7, but would fall away from the apically inclined mesial and distal surfaces as shown at *E*, Fig. 7.

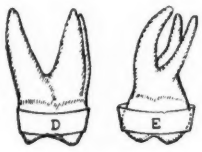


Fig. 7.

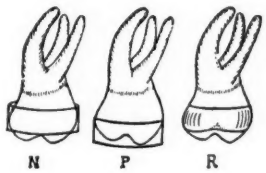


Fig. 8.

Fig. 9.

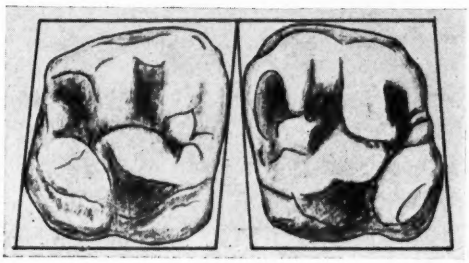


Fig. 10.

Even a cylindrical band forced upon the maxillary first molar beyond the contact points as at *N*, Fig. 8, would leave spaces between the band and the apically converging surfaces of the tooth mesially and distally.

However, if the cylindrical band, adapting itself at right angles to the contact points as at *P*, Fig. 8, is a nearer approach to the apically converging mesial and distal surfaces than the tapered band, it should be used as the base or foundation for the construction of an anatomically form-fitting band such as is shown at *R*, Fig. 8.

A study next of the form of the maxillary first permanent molar from the occlusal aspect will enable us to come to some conclusion as to a universal shape a maxillary molar band should take.

Thus, the mesial and distal surfaces of the maxillary first molar from an occlusal view at *M*, Fig. 9, are very nearly in parallel planes, the second molar

L, exhibiting planes which are slightly divergent buccolingually from the parallel, and the third molar showing still more divergent planes from the parallel than the second molar.

The general outline of the occlusal portion of the maxillary first molar is that of a rhomboid as illustrated in Fig. 10, or a parallelogram with oblique angles and the adjacent sides unequal in length.

The nearest approach, then, to an outline of the form a universal anchor band for a maxillary first molar should assume would be a change from a rhomboid form to that of a right angled parallelogram as at *X*, Fig. 11, curving the buccal and lingual sides as at *Y* in the same illustration.

The rhomboidal form might be attained in manufacture, but it would increase the cost of production, and in the practical application of the rounded parallelogram form of anchor band a slight burnishing will reproduce the rhomboidal form of the first molar.

The buccal and lingual taper of the band as shown at *Z*, Fig. 11, is the final change in the original cylindrical band as observed from the occlusal view.

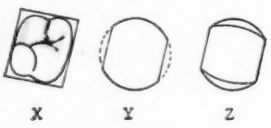


Fig. 11.

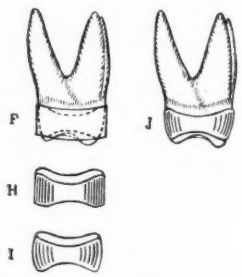


Fig. 12.

The most important point to consider next in the conformation of the rounded parallelogram form of anchor band to the mesial and distal surfaces of the maxillary first molar is the protection of the interproximate gum septum from the possible overextension of the gingival edges of the band by cutting down that portion of the band in a crescentic shape, as shown by the curved dotted lines at the gingiva in *F*, Fig. 12.

A lesser crescentic portion should be cut out of the occlusal edges of the band mesially and distally to prevent an overlap of the band upon the occlusal surface of the tooth mesially and distally, as shown by the curved dotted occlusal margin in *F*, Fig. 12.

The anchor band with gingival and occlusal crescents cut out will then appear as at *H*, Fig. 12. If the band is then contoured in its occlusal third to fit the average taper of the maxillary first molar buccally and lingually as at *I*, Fig. 12, in its manufacture, it will then fit the various surfaces of the tooth perfectly as shown in *J*, Fig. 12, needing the least manipulation and adaptation in the mouth.

Thus it is through a detailed study of the various surfaces of the maxillary first permanent molar and its various danger zones that I have developed a new series of anatomically contoured seamless anchor bands, Fig. 13, which conform in contour to the buccal, lingual, mesial, and distal surfaces of the

maxillary first permanent molar, and to these same surfaces of the maxillary second molar as nearly as is possible for a universal ready made molar anchor band.

These new anatomically contoured anchor bands are made in twelve graded sizes varying but 0.10 inch in diameter, with two extra sizes 0 and 00, the smaller sizes being adapted for use in banding small second molars and second deciduous molars in the maxillary arch, which latter are often used for anchorage in the earlier stages of treatment in children's mouths. A special graded

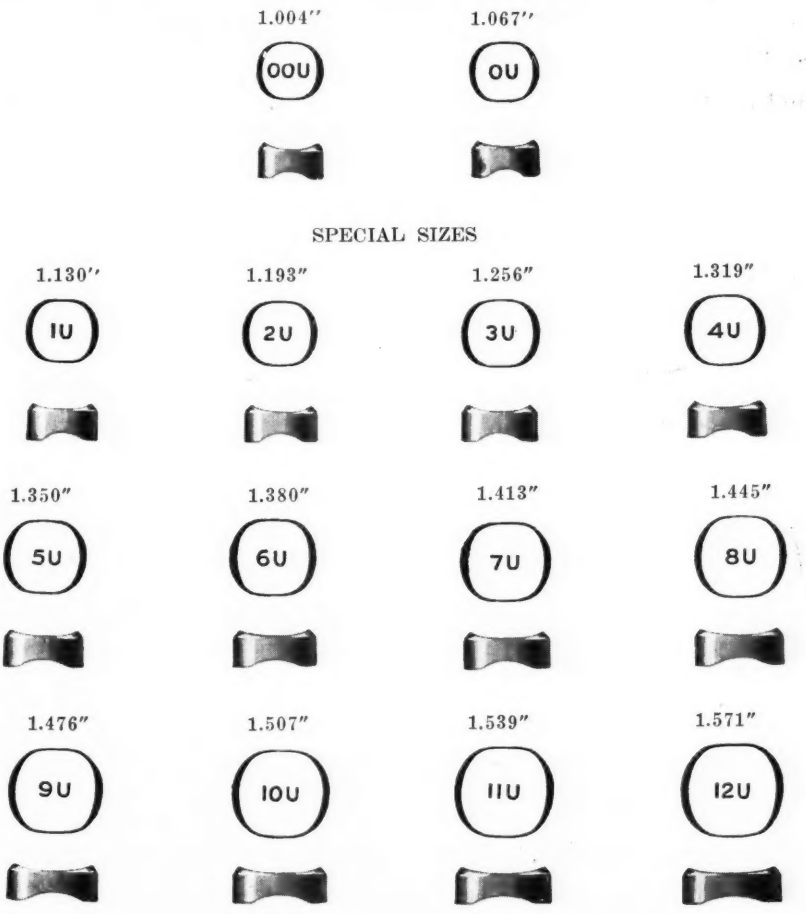


Fig. 13.—Anatomically contoured seamless maxillary molar bands. Gingival and occlusal crescents cut out 0.18 inch wide and 0.007 inch thick (circumferences shown above each band).

series of these anatomically contoured anchor bands for the second deciduous molars has been suggested by me to the manufacturer, the Williams Gold Refining Co., and will no doubt be produced by them in due time.

This new anatomically contoured maxillary molar anchor band is ready as it comes from the manufacturer for immediate placement upon the molar and final adaptation by instrumentation.

With fourteen sizes to choose from there remain but a few steps in operative technic to make one of these ready made and contoured anchor bands fit any maxillary first molar or second molar. Having first separated the first

molar from adjacent teeth so that the anchor band will slip on the tooth easily and without the friction of tight contact points which might confuse the operator in the choice of the proper size of band, a size is selected which will fit the molar snugly at the gingival line buccally and lingually where the fit can be observed.

In order to ensure a close adaptation of the band to the mesial and distal surfaces it is removed with a molar band removing plier, Fig. 14, and the mesio- and distogingival surfaces are bent inward with a pair of wide flat nose pliers, Fig. 15, so that these surfaces will conform to the apical convergence of the molar mesially and distally, the gingival edges hugging the tooth tightly as the band is forced into position.

A final contour of the bucco- and linguogingival edges of the band inward with a pair of contouring pliers, Fig. 16, ensures a snug fit of these edges to

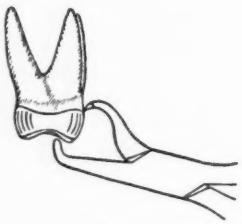


Fig. 14.

Fig. 15.

Fig. 16.

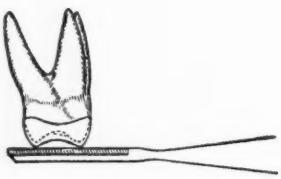


Fig. 17.

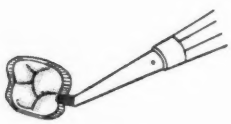


Fig. 18.

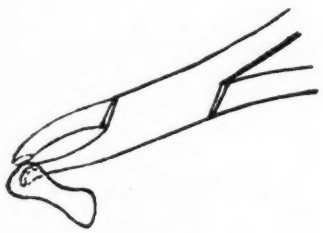


Fig. 19.

the buccal and lingual surfaces at the gingiva, and the extra pressure thus made at these edges tends to draw the mesial and distal margins still closer to the tooth at the gingival line.

The final placement of the contoured band upon the first molar is made with the band setter, Fig. 17, using a gentle but firm rocking motion, using the flat tin surface for contact with the occlusal edges of the band, and the tin edge of the band setter upon the mesio- and distoclusal edges.

The buccal and lingual grooves are next burnished in with the Young band adapter, Fig. 18, and the occlusal and gingival margins are given a final pressure adaptation.

In order to facilitate the formation of the buccal and lingual grooves I have designed a plier, Fig. 19, which will easily and quickly form these grooves on the buccal and lingual surfaces of the molar band before the final placement on the tooth.

This new anatomically contoured band can be adapted with considerable ease to the maxillary first molar with four or five cusps, Fig. 20, to maxillary

second molars and the larger premolars in the maxillary arch, as well as to the larger sizes of maxillary deciduous molars.

If we critically examine the buccal and lingual surfaces of the maxillary second premolars, Fig. 21, in relation to the taper of these surfaces as compared with that of the mesial and distal surfaces, we shall find that the planes are

Fig. 20.

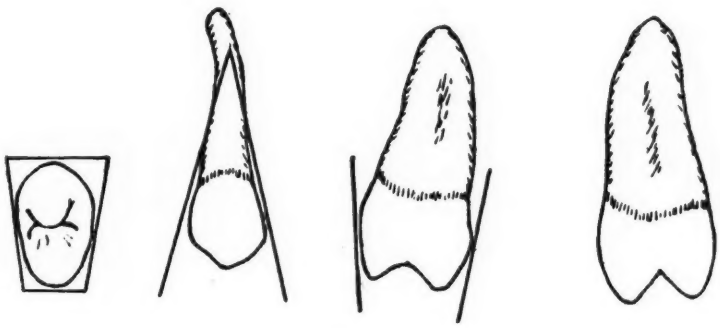


Fig. 21.

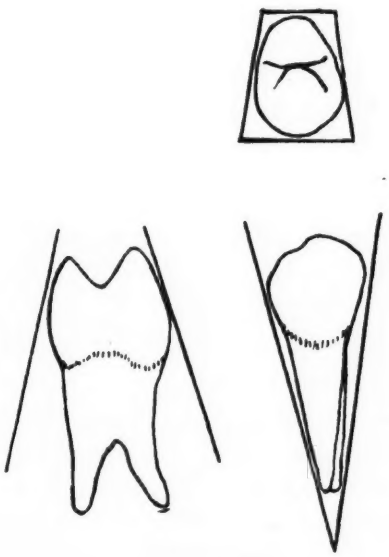


Fig. 22.

opposing each other in the same way that we find them in the maxillary first molar, calling for the same principles of band construction. Likewise, we find the opposing planes of the same surfaces of the first premolars, Fig. 22, are conformative to the same principles as those of the second premolars and first molars of the maxillary arch in relation to anatomically constructed anchor bands.

Looking down upon the occlusal surfaces of the maxillary first and second premolars, Fig. 23 (Diamond's *Dental Anatomy*), we find them to be of the form of an irregular quadrilateral with parallel buccal and lingual sides, and mesial and distal sides which converge from a wider buccal side to meet with a narrower lingual. These outlines of premolars coincide so nearly with the outline of the maxillary first molar, and the taper of the buccal and lingual surfaces is so nearly the same that a seamless anchor band on a smaller scale, Fig. 24, contoured in the same way and with the gingival and occlusal crescents cut out, may be standardized in a similar universal form, and a shorter series of graded sizes made for the various sizes of maxillary first and second premolars.

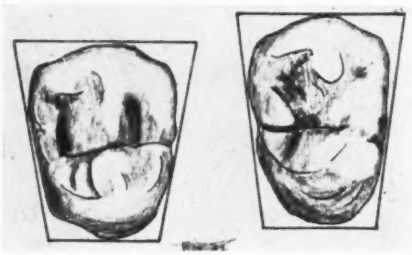


Fig. 23.

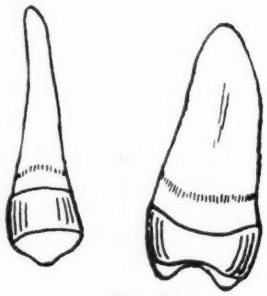


Fig. 24.

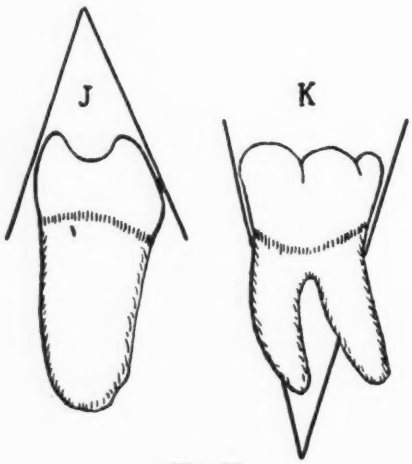


Fig. 25.

Fig. 26.

Fig. 25.—Excessive occlusal overlap, mandibular first molars.

Proceeding in the anatomic outline study to the mandibular molars and premolars, Fig. 25, we find the same danger zones on the various crown surfaces that we found in the maxillary molars and premolars, and on account of the lingual inclination of the mandibular molars and premolars, we find a greater danger zone on the lingual surfaces because of their inaccessibility for prophylaxis and the slowing up of self-cleansing action by the obstruction of appliances. Again, we find a greater danger zone on the buccal surfaces of these mandibular molars and premolars because of the greater distance attrition is carried downward on these surfaces as compared with the maxillary anchor teeth, as is noted by the greater wear on and flowing of the gold on

the bucco-occlusal margins of mandibular molar anchor bands as shown in Fig. 26. Proper band construction for the mandibular first molar, then, would demand a lowering of the bucco-occlusal margin to a line below the line of attrition. On the lingual side it would demand the simplest tube attachment, freed if possible from gum contact by a bellying out of the band itself.

A comparison of the angulation of the planes of the mesial and distal surfaces of the mandibular first molar with the buccal and lingual, Fig. 25, shows them to be opposed as in the maxillary molar, but with a very much greater inward tapering plane on the buccal surface as shown at *A* from the mesial view. A cylindrical band is very difficult to adapt to the more extreme tapering buccal surface of the mandibular first molar, and we must use a band with a taper as a foundation for the construction of a form-fitting anchor band from the anatomic outline presented.

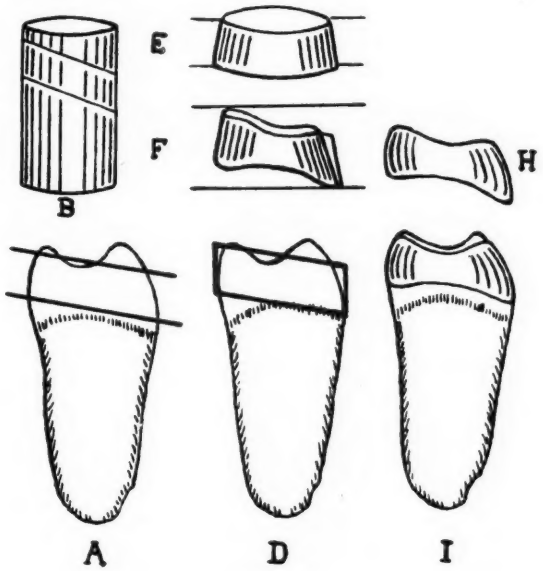


Fig. 27.

Furthermore, in order to drop the bucco-occlusal margin of the band as much as possible, the position of the band on the mandibular molar from the mesial view might be represented by two parallel lines as at *A*, Fig. 27, these lines crossing the tooth buccolingually at the lowest line on the buccal surface and on the highest line on the lingual. If a cylindrical band were used, it would assume the position as shown at *D*, and would have to be cut on the bias across a cylinder as at B, in the same figure.

A tapered band, *E*, Fig. 27, would also have to be cut on the bias across a cone to assume the form *F* with a higher lingual than a buccal side with even a further increase of the taper on the buccal side.

The finished band with its proper contours is represented at *H* and *I*, Fig. 27, and the various problems in relation to its manufacture as a ready made anchor band, capable of being graded in size for the largest mandibular molar and the smallest premolar, have also been solved.

A view of the perfected band, exhibiting the lowest position on the buccal and the highest position on the lingual surface, with the gingival and occlusal marginal crescents cut out is shown in Fig. 28. Fig. 29 illustrates a diminutive size of the same generally shaped and contoured band for the mandibular second premolar.

Viewed from the occlusal aspect, the mandibular first molars present the general forms of a trapezoid, Fig. 30, with a longer buccal and a shorter lingual margin parallel to each other, and the mesial and distal margins converging to meet the lingual. The five cusps on the mandibular first molar are nearly always present, and, although occasionally so reduced in size it is a mere tubercle, the fifth cusp is never found in the mandibular second molar, being the distinguishing mark of the mandibular first permanent molar. Occasionally a third cusp is found on the lingual side.

Fig. 28.

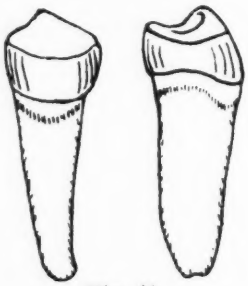


Fig. 29.

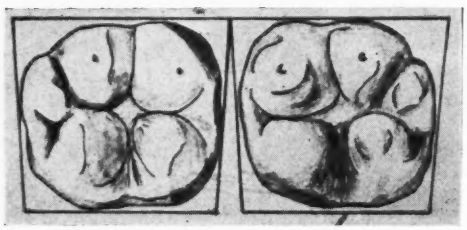


Fig. 30.

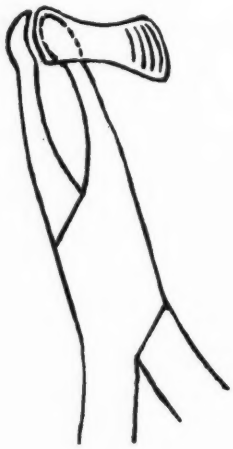


Fig. 31.

In addition to the other more complicated problems of manufacture as a ready made anchor band for the mandibular molars and premolars the trapezoidal shape is not difficult to attain.

The bellying out of the lingual surface of the mandibular molar seamless anchor band in order to keep the lingual tube farther away from the lingual gum tissues is done with a contouring plier as shown in Fig. 31, the same plier being used for all of the other extra contouring before the band is finally placed in position in a similar manner illustrated for the contouring of the maxillary first molar anchor band. The same bending inward of the mesial and distal surfaces of the mandibular anchor band with a flat nose plier and the same placement of the band upon the tooth with the tin surfaced band setter is indicated as used in the final technic steps of adaptation of the maxillary first molar anchor band.

The quality of the material from which the anchor band is constructed bears a distinct relationship to the health of the dental tissues, for, if the band material is too soft, it will stretch and the band will loosen under strain, or curl up on occlusal edges and split. The band should be capable of slight stretching in cases where it seems necessary and should be done with a band stretcher with a set screw as in Fig. 32.

Edge strength and durability through the quality of hardness, as shown in retention of edge form on the occlusal edge and of band form in non-stretching and prolonged close adaptation to the anchor tooth without loosening, are prime essentials, and can only be attained in a reasonably hard band material. Ease of adaptability is a desirable quality, but of secondary importance, as each degree of greater adaptability sacrifices an equal amount of edge strength and durability. A Brinell hardness of approximately 108 is required. These bands may be annealed in a Bunsen flame with very slight softening of the metal.

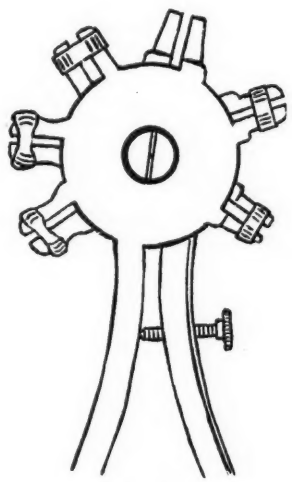


Fig. 32.

The material should be noncorrosive, nonoxidizing, and with a fusing point of 1750° F.+, which necessitates the use of the noble metals, preferably gold, platinum, and palladium in proper formula to include other requirements mentioned.

A tensile strength of approximately 7500 lb. per square inch, a proportional limit of approximately 55000 lb. per square inch, and an elongation of 5 per cent + are indicated in anchor band material to meet the proper requirements.

A thickness of 0.007 inch is necessary for sustained strength in the band material. A greater thickness is unnecessary and would decrease the quality of adaptability and would make it more difficult to use the anchor band in case of tight contact points which is not infrequent, though undesirable.

A width of 0.18 inch on the buccal and lingual sides of the anatomically contoured band is wide enough so that the band can usually be placed in position without any trimming down of the gingival margins buccally and lingually. A wider band might be used, but would almost invariably require trimming.

In adapting an anchor band to any first permanent molar, especially in the mouth of a child from six to eight years of age, care must be taken not to force the band toward the gingival tissues too rapidly, as the first molar is not fully erupted, as noted by the overlapping gingival tissues, and the limit gingivally to which the edge of a band may extend must be felt for by a gradual approach through gentle pressure on the occlusal edges.

If the band is too large, or if it is forced down too far without proper adaptation, it will cause pain, and the blanching of the gums in the area of pain will indicate where the band is extending laterally into the soft tissues or too far gingivally. Either of these warnings should be heeded immediately and a smaller band used if possible, to avoid lateral impingement upon the soft tissues, or the buccal and lingual gingival edges should be contoured in to hug these surfaces more closely as well as the mesial and distal, as the band is again gradually forced into position.

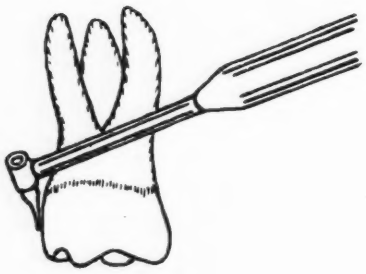


Fig. 33.

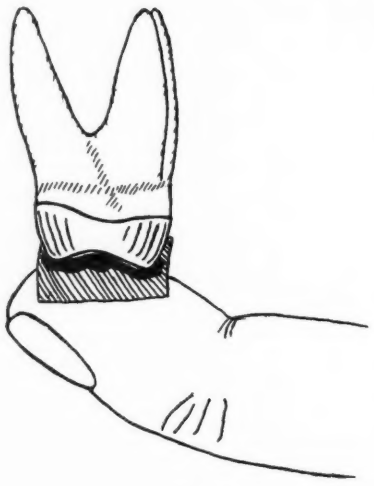


Fig. 34.

If pain or blanching still persists to any degree in the closest fitting band, the gingival edge should be cut down slightly in the area where the pain or blanching occurs, succeeded by further contouring in of the buccal and lingual edges toward the gingival, as well as bending the mesial and distal sides of the band still further inward from the gingival aspect toward the long axis of the tooth with a flat nose plier.

A final word as to the preparation of the anchor tooth itself before cementation of the band is not amiss in a discussion of this kind which has for its main theme the preservation of the health of the dental tissues.

In this respect a preliminary examination of the surfaces of the crown of the anchor tooth for caries, leaky or expanded fillings, etc., before banding the tooth is entirely in order, and, if any of these are found, the patient should be referred to the family dentist for necessary repair of the dental defects.

If the crown of the anchor tooth does not need repair, it at least needs careful prophylaxis before cementing on the band, and should be first bathed in a disclosing solution to show up the surface film through staining, and then polished with an orange-wood stick, Fig. 33, and pumice, even in the inter-

proximate embrasures. A final swabbing with alcohol on a cotton pledget will assure the complete removal of the film from the surfaces of the anchor tooth which is then kept dry until the band is cemented into position.

A quick setting cement should be not too thickly applied to the inner surface of the anchor band with a spatula, the band placed in position on the anchor tooth, and with a rubber finger tip on the index finger, Fig. 34, the cement should be forced between the tooth and band after the latter has been forced gently to place with the band setter.

Having followed the indications of an anatomic survey of the crown surfaces of the first permanent molar in particular in constructing a universal contoured molar anchor band so that it will follow the general contour of the anchor tooth without impingement upon the soft tissues, or overextension upon occlusal surfaces of the crown of the molar, repaired any defective surfaces, and perfectly cleaned and dried the various surfaces of the crown to be covered by the band, we can feel assured that the dental tissues will be preserved from inflammation or injury during orthodontic treatment in so far as the proper construction and adaptation of the anchor band are concerned.

THE VALUE OF THE MINERALS IN VEGETABLES, FRUITS, AND MILK, IN THE DIET OF CHILDREN*

By William W. McKibben, M.D., Miami, Fla.

"TELL me what you eat and I will tell you what you are."—Hippocrates.

Of all the therapies available for children, the science of foods and the art of dietetics is by far the most important. Just what is the physiologic definition of food? It is any chemical substance or combination of substances capable of aiding in the preservation of the quantitative and qualitative integrity of the body during the process of physiologic consumption thereof and helping to keep up the slow oxidation which constantly consumes the tissues of the body. Food is any physiologic tissue builder or tissue consumer that enters the organism through any part of the alimentary canal.

Tissue builders preserve the structure of the body and are called proteins, proteids, albumens, albumines, albuminoids or nitrogenous foods, synonymous terms. The principal ones are lean meat, eggs, milk, cheese, beans, peas, lentils, and glutens of all cereals.

The tissue consumers add heat or force by providing fuel and by being consumed. They are called carbohydrates, or starches and sugars, and hydrocarbons or fats.

Some foods belong to both classes, such as milk, meat, eggs, wheat, oats; but generally speaking the animal foods are tissue builders (nitrogenous) while the vegetables are tissue consumers (carbohydrates).

The large amount of liquids (water) and the mineral salts needed by the body are mostly contained in the above-mentioned foods. Water, the most important element, represents 65 per cent of the body, which requires about 80 ounces daily. The body cells are distinctly aquatic; the blood needs water to circulate freely, and water is the bulk of excretions through bowels, kidneys and skin.

In the history of the feeding of babies and children, some of us date back far enough to have observed the rise of the percentage method with adequate fats, carbohydrates and proteins; then came the caloric requirements, the vitamins down to H; and finally now we learn that there must be a proper balance of calcium and phosphorus, of potassium and sodium, of acids and bases to avoid so-called metabolic disorders.

Lately scientists have concentrated on two large groups of mineral substances: (1) Those elements (sulphur, phosphorus and chlorine) whose combustion results in the formation of substances acid in reaction and taste; and (2) the metallic elements (sodium, potassium, calcium, magnesium, iron, manganese, aluminum, etc.) forming products of combustion (bases) alkaline

*Read before the Southern Society of Orthodontists, Miami, Fla., Jan. 13-15, 1931.

in reaction and caustic in taste. Oxidized, both help to form proteins and the living cell, the acid-forming substances preponderating in the tissues. The inorganic bases neutralize and eliminate metabolic acids by digestion and combustion.[1]

Death ensues if the blood becomes only slightly acid, consequently the body fluids (blood, lymph, etc.) are alkaline to preserve its biochemical condition, to perform its physiologic functions, e.g., of eliminations of the end-products of metabolism from the tissues to the excretory organs to be thrown off from the body.

Acids cannot be excreted as such; they must combine with bases to form soluble salts to be eliminated by the kidneys and large intestines; blood can take up carbon dioxide from the muscles to the lungs only if there are enough inorganic bases in the blood. Therefore it is vital that the daily diet contain enough of these bases to exceed the acid-forming foodstuffs to promote the exploitation of the proteins, to neutralize the excess acids the body produces.

Ammonia is caused by protein decomposition; this is much in evidence in the cribs and diapers of babies and children who have insufficient base intake and are thus wasting protein. But if adequate bases preponderate (i.e., milk, fresh fruit and fruit juices, vegetable juices and well prepared green vegetables, not scalded), then there is established an "alkali reserve" or "buffer substances" in the blood in amounts greater than the ordinary needs, a real "margin of safety" or protection against any accumulation of acids resulting from their overproduction or retention in the body.[2]

One of the greatest advances made in recent years in the feeding of babies has been the discovery that certain organic acids, such as lactic, citric, acetic, etc., increase this "buffer action" and much increase the infant's sugar, fat and protein tolerance.

The food should not contain more protein than just enough to cover the daily quantity spent by the vital processes (approximately 40 gm.[3]), e.g., bread, given without added bases in metabolic experiments raises the protein spent to 90 gm. daily in four weeks; an increase of 250 per cent. Meat, which produces a large quantity of acid products of combustion, covers the protein requirement; with the addition of the inorganic bases, the protein demand is only 25 gm. (125 gm. of meat). If the bases are omitted, however, the protein demand rises within three weeks to six times this amount or 140 to 150 gm. (750 gm. of meat).

So, inadequate bases allow ammonia to be formed by protein decomposition, the by-products of which are waste-products of metabolism, e.g., uric acid, the cause of various disorders.

According to Liebig's minimum law, each base is required to be present in excess; e.g., if there is a deficiency of a certain base such as potassium or calcium, a superabundance of the other bases can support the growth only for a short time.

The action of growth completions (water soluble vitamin B) is dependent on its action on an abundance of bases; the skeleton growth (bones and teeth) is rapid then, and waste elimination complete. If deficient, the child loses in

weight, and, too, Funk's vitamin and fat soluble vitamin A are inactive. If potassium and calcium are deficient, the curative action of the fat soluble complement is hindered; for this reason butter is not as efficient in corneal disorders as raw spinach juice and other vegetables rich in vitamin A and in calcium.

There must be a basic preponderance in the fattening of animals, and chalk (calcium) is used; an excess is needed in curing scurvy and diabetic ketosis (acidosis). Decreased alkalinity of the blood with a deficiency of alkali bases, the so-called hyperacid conditions, materially lowers the resistive or defensive powers of the body against bacterial invasion. We know that there is a direct relationship between alkalinity and immunity, the former being lowered in nearly all infectious diseases, as in the common cold.

The fruit acids are converted in the system into potentially base alkaline carbonates, thus enabling the blood to keep the uric acid compounds in solution and to facilitate their removal. These bases are sought by the acids of imperfect digestion obviating union with similar bases found in bone, teeth and the cartilages of joints.[4] Alkaline salts, either natural or artificial, give favorable results in the treatment of dental caries, tetany, purpura, bleeders, and urticaria, through eliminating deleterious nitrogenous products and favorably influencing circulation, glandular secretions, peristalsis and metabolism.

Alkaline therapy must be thought of in the food intoxications of children, in acid intoxication, before operative procedures, and incidental to anesthesia.[5]

The nutritive substances and salts of vegetables are soluble in water; consequently they are lost if the vegetables are scalded or boiled. The cells burst, the contents are lost, so acid forming exceeds, and the health producing powers of vegetables are lost. Ample protein, fats and carbohydrates and vitamins are furnished by vegetables if they are not wasted in cooking. Do not heat vegetables too strongly, too long, or repeatedly. It is taste vs. value. Raw vegetables and fruits and juices in salads are of great worth. But avoid the abuse of table salt. Iron is no longer regarded as the exclusive remedy in anemia; its utilization there is conditioned by the presence of manganese or copper, or both, as well as certain vitamins.[6] But the hemoglobin index and red cell count may be reduced by acidosis; the acids destroy red blood corpuscles in the test tube; it has been shown that the acids not absorbed in the stomach enter the blood from the intestines and destroy the corpuscles, producing anemia. By regulating the acid-alkali balance in diseases through diet and alkaline waters, tonic and reconstructive treatment is quick and more effective. Unless time and social position prevent, a proper dietary will obviate the necessity of using one of the mineral preparations on the market, many of which contain the mineral salts of vegetables and fruits.

To summarize, the normal diet should contain:

1. A sufficient supply of foods to insure natural bowel movements.
2. Alkaline acid foods to balance the acid ash foods.
3. Starches and sugars to prevent the acetone type of acidosis.
4. Food units, or calories to maintain the individual under unusual activi-

ties at a normal weight for the age, sex and height. Overweight, as well as underweight, should be avoided.

5. Protein.
6. Mineral containing foods.
7. Vitamins.
8. Fluids.[7]

Here in the Southeast Atlantic and Gulf Coastal States, it has been shown that there is an abundance of minerals in the soil which plants will transmit to man. Iodine, like iron and manganese, is concentrated in those parts of plants which contain most chlorophyll, and hence are most active in biologic processes. Leaves of such vegetables as beets, turnips and carrots, invariably contain more iodine than the roots. Spinach and lettuce lead and are far ahead of cabbage, asparagus and the tuber vegetables growing underground, as well as the seeds or grains. As natural sources of iodine along our southeast coast, salt water shellfish and crustaceans come first, sea fish and leafy vegetables in our nongoiterous area rank second. Improper calcification is dependent on calcium supply, calcium-phosphorous rates, parathyroid activity, and vitamin D. Vitamin D can be produced in the body by the action of ultraviolet rays on the skin. The rays are impotent through window glass and are greatly reduced through a screen. This potency varies with location, being marked in this area where there is little dust, clouds, or fog to filter out the actinic rays of the sun, which rays fall most vertically here (Miami).

Again, the calcium and the calcium-phosphorous ratio is most pronounced in the green leafy vegetables that grow above ground. Milk, however, is probably the best source of available lime.

It has been again demonstrated recently that persons who include vegetables and fruits in their diet show higher hemoglobin and higher cell count. Both iron and copper are necessary for regeneration of hemoglobin in rats made anemic by milk diet.

Just where does the young child on a normal diet get its iron and copper? Lettuce, spinach, carrot, beet and turnip leaves are rich in iron; but not the same order is observed in regard to copper.

The conclusion of the studies made here in the South is that the leafy parts of plants are far more valuable in minerals (calcium, phosphorus, iron, manganese, copper and iodine) than the roots. Experiments made on rats made anemic on a two months' milk diet with reduction of hemoglobin of 40 per cent, showed weights and blood brought back to normal in seven weeks by the addition of powdered spinach.[8]

Many of our old convictions about teeth and their care are being ruthlessly destroyed by the scientific discoveries of today.[9] Orange juice will prevent dental decay, candy is not to blame for toothaches, and thumb-sucking does not deform a child's mouth. Like the apple and the proverbial doctor, eat plenty of fruit and vegetables and drink a quart of milk a day and thus keep the dentist away. Dr. Percy Howe, of the Forsyth Dental Infirmary and the Harvard Medical and Dental Schools, maintains that these will save, improve and harden the teeth, and will even stop pyorrhea.

"Drink a pint of orange juice a day and you will forget what a dentist chair looks like and rarely have to visit a doctor.

"Decay of teeth is not, as most people still believe, caused by bacteria. It is a form of bone degeneration resulting from improper food, food lacking in mineral salts and the mysterious vitamin C, the substance which preserves and builds up our bones. Orange juice is particularly rich in this vitamin and other fruits contain it in varying degrees."

Under Doctor How's direction the Infirmary has treated about 400 children a day since 1914, and as a result, dental troubles among the Boston school children have been reduced 50 per cent.

"Tooth decay," he explains, "is one of the penalties of civilization. Archeologists have revealed that primitive man, who lived on raw, natural foods, had perfect teeth. And that is what started me on my experiments. The monkeys you see in those cages have been my helpers. This," he picked up one of the skulls on the desk, "is the head of one fed on orange juice and raw vegetables. Notice the even, well preserved teeth." He dropped it, chose another which contained only a few scattered teeth. "And here is a fellow who lived on cooked meat and cereals.

"By further experiments I soon learned that the fruits and vegetables highest in mineral and vitamin content did most to preserve the teeth. For example, spinach and cabbage, I found, were better than string beans. Bananas were better than grapes. Orange juice was best of all." Dr. Howe is looking forward to the new generation for maintenance of a balanced ration.

"But," you may protest, "last week the dentist found three new cavities in my teeth, and yet I eat fruits and vegetables."

"Undoubtedly you do, but you use them as side dishes and not as the main course," Doctor Howe will reply. When he tells you to eat fruits, vegetables, and milk, he means for you to eat them in large quantities and at every meal. Moreover, the vegetables preferably should be of the leafy type, such as lettuce, spinach, beet greens, and dandelions, all of which are rich in minerals. And a good proportion of them should be eaten raw, for cooking reduces the vitamin value of any vegetable.

Tomatoes are the least affected by cooking. The tomato juice cocktail or the morning glass of tomato juice, Doctor Howe said, has about half the vitamin value of a glass of orange juice. That percentage is greater than for most cooked vegetables. While canned fruits and vegetables are not so valuable as fresh foods, a good grade of canned fruit or vegetable is better than none.

For a child an ideal diet recommended by Doctor Howe is approximately as follows:

For breakfast: Whole milk, banana with cream, cereal, and a glass of orange juice. For lunch: Vegetable soup, a poached or soft-boiled egg, a glass and a half of milk, a baked potato (skin and all), lettuce and tomato salad, and graham bread. For dinner: A glass and a half of milk and graham toast.

"An adult," he explained, "should have about the same diet, except that he may add meat now and then to break the monotony. A moderate use of

meat and cereals is not injurious, and it prevents meals from becoming tiresome. But the average person eats far too much meat. Man is essentially not a meat-eating animal. The only carnivorous teeth we have are the eye teeth. We are built for a vegetable diet, as is evidenced by the grinder teeth and cutters.

"We may think that animals are stupid and inferior, but they can give us pointers on eating. One point is, whatever you eat, eat every part of it, not just the tender and appetizing morsels. The lion, when he kills a zebra, does not cut off a few tender chops and a steak or two and turn them over to Mrs. Lion to fry. He eats all of the animal, raw. That is why he has such strong teeth. Much the same holds for man when it comes to consuming vegetables. The leafy part of a vegetable, such as beet greens, is much more valuable than the vegetable itself. The raw leaves contain nearly all the vitamins and are rich in mineral salts."

Doctor Howe, incidentally, lives what he preaches. He drinks a pint of orange juice a day, half at breakfast and half just before retiring. And he eats large quantities of raw vegetables and fruits. Peaches, he says, are excellent for anemia. Other fruits which he recommends are pears, apples, melons, bananas, and strawberries. His favorite vegetables are spinach, peas, beet greens, and lettuce.

"Candy," he said (and thousands of children have learned to love him for it), "is not injurious to the teeth. The main harm caused by sweets and soda fountain products is that they blunt the appetite. They should be taken only after meals.

"Another popular belief which has been disproved by our experiments is that thumb-sucking injures the teeth of a baby and causes mouth-breathing. Both these conditions we now know are due entirely to improper diet. In our tests with monkeys we found that in those which had been fed on foods lacking in mineral salts and vitamins the normal growth of the bones which carry the teeth have been arrested, causing small and malformed jaws in which there was not room for the teeth to come through evenly. Also, the bones of the nasal passages were narrow and small, making breathing through the nose difficult."

Again Doctor Howe illustrated his point with two of the little skulls on his desk.

"Dental decay is more than a sign of deficient food," he went on to explain. "It is also a symptom of dangerous bodily changes that eventually bring on more serious diseases. The breaking down of the dental structures is caused by lack of sufficient lime, which is utilized in the body for many purposes. One of these is to neutralize acid condition. Meats and cereals introduce acid into the system, and if we fail to eat enough lime-producing food to counteract the acids, the body draws on the teeth and the structure around them for its lime supply.

"The reason milk is so good for us is that it is rich in lime, and fruits and vegetables contain the mineral salts and vitamins which enable our systems to assimilate it."

Doctor Howe has traced the disease of the gums known as pyorrhea to an inadequate supply of lime in the body. A recent case in the Infirmary was that of a man who had tried almost every "cure" for the disease, without results. Doctor Howe prescribed a lime producing diet, which, he said, effected a permanent cure in ten days.

"Many dentists still believe," he said, "that tartar on the teeth comes from a normal and harmless secretion of the salivary glands. In the laboratory we have learned, however, that it appears on the teeth only when the body is not being properly supplied with lime. Therefore, the formation of tartar is a warning that should be heeded immediately."

Instruction for expectant mothers is one of the important duties of Doctor Howe and his assistants. The mothers are told the value of mineral food in the care of babies and are themselves placed on a strict diet to insure proper start for the teeth and bones of the child-to-be.

The four hundred children who visit the Infirmary each day not only have their teeth examined, repaired, and cleaned by a staff of forty-two interns but receive detailed instructions for the prevention of future troubles.

Usually the child is accompanied by its mother. First, it is taken before a hygienist, who conducts his examination while the subject is playing with colored blocks or pictures on the floor. Then a dentist examines the teeth and mouth of the child and makes whatever repairs are necessary. After that there is a medical examination, and then come questions regarding its diet and habits of sleep and play.

"Never," says Doctor Howe, "was the effect of diet so clearly demonstrated as in the case of two fifteen-year-old boys who visited the Infirmary one day last year. The teeth and mouth of one were in a deplorable condition. The other had a set of perfect teeth."

The diet of the first, the doctors learned, was usually as follows: breakfast, coffee and doughnuts; lunch, macaroni and coffee; dinner, cake, bread and tea.

The diet of the second was: breakfast, orange juice, cereal, and graham toast; lunch, meat, mashed potato, green peas, cabbage salad, pie, and milk; dinner, spaghetti with tomato sauce, rye bread, grapefruit, and milk.

To make the children feel that they are not objects of charity, the Infirmary charges each a fee of five cents. But if the patient does not volunteer to pay it, nothing is said.

An important phase of the Infirmary's work is called "classroom service." Members of the staff make weekly visits to community centers in Boston and the surrounding towns where they address meetings of mothers on prenatal care and the proper feeding of children to prevent postnatal trouble. Each year the number of meeting places increases. Each year the audiences grow larger.

"And that," says Doctor Howe, "is the highest reward we could wish for our efforts, for it means healthier teeth and fewer toothaches all around."

CONCLUSIONS

The chemical threat of acidosis hangs over the life of human tissues as does the biologic menace of bacteria. Our tissues demand for their very existence, that they be constantly bathed in an alkaline fluid.[10]

Diet plays the most important rôle in treatment of the acid-ash type of acidosis. To prevent this, individuals must balance their diets with ample amounts of fruits and vegetables. Less bread should be eaten, and more milk should be used instead of so much meat, fowl, eggs and fish. For hard, normal labor, dried beans and dried lima beans, which are the most alkaline food known, containing 41.65 points of alkalinity, and thus as a flour can be safely mixed with equal parts of wheat flour with or without nuts, raisins, and yeast. Its use in muffins, pancakes or waffles, should be urged[11] in the prevention and treatment of acid-ash acidosis.

Sodium bicarbonate (baking soda) may be used temporarily in level teaspoon doses, but its use is proof that the diet has not been properly regulated.

REFERENCES

1. Juettner, Otto: Physical Therapeutic Methods, Harvey Printing Co., Cincinnati, 1910, pp. 48-50.
2. Warner, Wm.: Hyperacid Conditions, Their Relief and Correction, New York, 1926, pp. 1, 2 (pamphlet).
3. Leonard, Edward: The Significance of Physiologic Mineral Substances in Nutrition, 1930, Menley & James Publishing Co., pp. 1-13.
4. The Therapy of Acid States, Amer. Apoth. Co., New York, 1930, pp. 1-5.
5. Marriott, W. McKim: Infant Nutrition, St. Louis, The C. V. Mosby Co., 1930, p. 322.
6. Warner, Wm. R.: Acidosis-Ketosis, New York, 1930, p. 1 (pamphlet).
7. Sansum, W. D.: The Normal Diet, St. Louis, The C. V. Mosby Co., 1930.
8. Remington, Roe E.: Geography in Human Nutrition, 1930 (personal communication).
9. Griffin, Jno.: How to Dodge the Dentist, American Magazine, October, 1930, pp. 23, 24.
10. Cornwall: The Therapy of Acid States, Amer. Apoth. Co., New York, 1930, p. 1.
11. California Lima Bean Growers Association, Oxnard, Calif.

TREATMENT OF NEUTROCLUSION

By Martin Dewey, D.D.S., M.D., New York, N. Y.

IN CONSIDERING the treatment of neutroclusal conditions, we shall deal with those cases that have usually been referred to as Class I. These cases include those which are characterized by a normal anteroposterior relation of the mandibular arch to the maxillary arch as related to the face and cranium.

In speaking of dental arches, we refer to what may be considered as a sufficient number of teeth which have all the anatomic characteristics and relations that would tend to indicate they occupy the proper position to the face and cranium. These anatomic conditions include the teeth as related to the opposing arch and as indicated by the proximal contact of the teeth in the same arch.

We recognize the fact that in certain etiologic factors, one or more teeth may have drifted so as to assume an abnormal relation to the opposing teeth, also they may have an improper contact with the proximating teeth and at the same time possess an abnormal relation to the face and cranium. This malrelation of one or more teeth does not necessarily disturb the arch relation as a whole as related to the face and cranium.

In studying neutroclusal conditions for the purpose of diagnosis and treatment, we find they can be placed into four general groups.

The first group will include those cases characterized by a decided lack of lateral development. These cases are known to the public as bunched and crowded arches. The bunched and crowded condition indicates a disturbed or rather lack of lateral development, but careful examination will generally reveal that these cases also possess a lack of the proper amount of forward and vertical development. They may be described as representing a retarded development in all directions. It is necessarily assumed that the dental arches grow downward, forward, and outward as related to the cranium. These cases generally possess normal lip action during the growth period of the life of the individual. The patient may at times suffer from nasal stenosis, but he is ordinarily a normal breather.

The second type of cases includes those which have normal anteroposterior relation to the arches with protruding maxillary anterior teeth. These patients present more or less of an underdevelopment of the mandible which may be characterized as a micromandibular condition. They are generally mouth breathers with abnormal muscular action. The patients or parents may insist they do not breathe through their mouths, but if they were not mouth breathers with abnormal muscular action, this type of malocclusion would not exist.

*Read at the twenty-ninth annual meeting of the American Society of Orthodontists, Nashville, Tenn., April 8-11, 1930.

The third group includes those cases which have a normal anteroposterior arch relation, the maxillary incisors occupying a lingual position to the mandibular incisors. These patients have well-developed mandibles, and are generally normal breathers with normal muscular habits. There is more or less of a micromaxillary development.

The fourth group of cases includes those patients with the normal anteroposterior arch relation to the face and cranium with an anterior position of the maxillary molars and premolars. These patients are generally normal breathers with normal muscular habits, but occasionally we find one with protruding maxillary anterior teeth with abnormal lip habits and mouth breathing. These cases are very often incorrectly classified and treated as Class II, Division 1, and when so classified, they generally supply the case which is later described as a Class II case in which the maxillary arch was too far forward. These conditions are not posteroclusion conditions, because the mandibular arch occupies the proper relation to the face and cranium.

In the treatment of the first type of neutroclusal conditions, namely, those with bunched arches, the general indication is that of lateral development. We have called your attention to the fact that in these cases, there is also a retarded vertical and anterior development of the arches as related to the face and cranium. In treating these conditions, it is very necessary that the molars which are used for anchor teeth are not displaced posteriorly. This objectionable result was called to the attention of the profession several years ago by Dr. Barnes of Cleveland, and to overcome such a condition at that time, Dr. Barnes introduced the use of facial anchorage for the purpose of stabilizing anchor teeth and assisting in the reduction of the required forward development of these cases. Facial anchorage was never popular owing to the fact that the appliances were so conspicuous.

However, it was based upon an important condition existing in this type of case. In the majority of these cases, if care is observed not to displace the anchor teeth, they can be successfully treated by lateral expansion. This expansion can be accomplished by using either the labial or the lingual appliance.

As it is necessary to obtain a certain amount of vertical growth as well as an anterior growth in the treatment of these conditions, it is very essential that any type of appliance employed must be one which will allow the greatest possible freedom of growth and development during the period of treatment. Any style of labial or lingual appliance which lashes the teeth rigidly together is an improper appliance in the treatment of these conditions, because it interferes with the proper growth and development.

The second group of cases includes those which have a normal anteroposterior arch relation with protruding maxillary anterior teeth. In the correction of the deformity which exists in the maxillary arch, it is necessary to expand in the molar, premolar and canine regions, and to retract the maxillary incisors. This can be done very satisfactorily with the ordinary round labial alignment wire. The labial alignment wire is adjusted so as to produce the proper expansion in the molar, premolar and canine regions which means that the alignment wire stands slightly away from the premolars and canines.

The nuts do not touch the tubes on the molar bands, and the alignment wire rests against the maxillary incisors. Intermaxillary hooks are placed on the labial arch about the region of the proximal contact between the canine and the lateral incisor.

The mandibular arch can be treated by either a labial or a lingual appliance. However, a lingual appliance with auxiliary springs makes an ideal appliance, but does not allow us to stabilize the mandibular molars against the forward pressure exerted by the maxillary rubbers to as great an extent as does the labial alignment wire. Owing to the fact that intermaxillary rubbers are used to retract the maxillary anterior teeth, there is necessarily a forward pull on the mandibular anchor teeth. This forward pull of the intermaxillary rubbers on the mandibular molars can be counteracted by making a gingival bend and an occlusal spring in the labial alignment wire. This produces a backward pressure on the mandibular molars which overcomes the forward pull of the intermaxillary rubbers.

The maxillary teeth of these cases can also be treated by using a combination of lingual appliance and high labial alignment wire as suggested several years ago by Dr. Lourie. Such an appliance is more inconspicuous than the ordinary labial alignment wire just referred to.

In the third type of case, while the maxillary anterior teeth occupy a lingual position to the mandibular anterior teeth, we may employ either a labial or a lingual appliance on the maxillary arch. The maxillary arch in this case may be described as being a micromaxillary condition with a decided lack of development in the premaxillary region. If a lingual appliance is used, it may be either of the soldered or of the removable variety, auxiliary spring being employed for the purpose of producing expansion and carrying the maxillary anterior teeth forward. Owing to the fact that the maxillary anterior teeth must be made to develop labially against the force of occlusion of the mandibular incisors, care must be taken to avoid the displacement of the maxillary anchor teeth. This can be avoided by using intermaxillary rubbers the same as they are used in the treatment of anterior occlusal conditions.

In these cases the mandibular teeth may or may not be badly bunched. It is generally advisable to use some sort of an appliance on the mandibular teeth to prevent the developmental force which is applied against the maxillary incisors from causing the mandibular incisors to develop forward. It is always necessary to use some form of mandibular appliance in order to provide means for the attachment of the intermaxillary rubbers that are used to stabilize the maxillary molars, even though it may not be necessary to produce any development in the mandibular arch.

The next group of neutroclusion cases which we will consider includes those cases in which the maxillary molars and premolars have assumed an anterior position to the face and cranium. These cases are generally the result of early extraction of the deciduous molars. The maxillary molars and premolars assume a forward position on one or both sides. These cases have erroneously been classified and treated as posterior occlusion, although they

have none of the characteristics of posterior occlusal conditions. The mandibular arch has a proper anteroposterior relation to the maxillary incisors. The mandible is well developed.

These patients are generally normal breathers. The anterior teeth are generally bunched. We realize that in some cases the patient may be an abnormal breather with abnormal lip habits in which case the maxillary incisors would protrude. Owing to the abnormal breathing and abnormal muscular development, there would be the same underdevelopment of the mandible that is found in the other group of neutroclusion conditions, in which we have a proper relation of the maxillary molars to the face and cranium with a protrusion of the maxillary anterior teeth. This group of patients who have an anterior position of the maxillary molars and premolars and protruding maxillary anterior teeth, are generally referred to as posterior occlusions. These cases are the ones which are generally referred to by the man who claims that extraction of the first premolars is necessary in the treatment of posterior occlusions.

There are two general plans of treatment for those cases in which the maxillary molars and premolars also have assumed a forward position to the face and cranium, regardless of whether the maxillary teeth are bunched or protruded. The first one is to produce a posterior development of the maxillary molars and premolars, followed by the necessary movement in the maxillary incisor region. This plan should always be followed in young patients. In older patients, especially where the case may be complicated by previous extraction or by badly decayed or broken-down teeth, it is then possible to produce a compromise by extracting a tooth on each side of the maxillary arch in the premolar region and retracting the maxillary canines and lining up the maxillary anterior teeth.

The posterior movement of the maxillary molars and premolars may be accomplished by using either a labial or a lingual appliance. If a labial appliance is used, it is adjusted with the nuts against the tubes on the molar bands and the outer portion of the alignment wire stands away from the anterior teeth. By means of intermaxillary rubbers, pressure is produced upon the maxillary molars to cause posterior development of those teeth. After the maxillary molars begin to develop posteriorly, the premolars can be ligated to the tube on the molar bands by a long loop ligation in such a way as to produce posterior pressure on the premolars. After the molars and premolars have assumed their normal anteroposterior position, then the intermaxillary rubbers are dispensed with in those cases in which the maxillary anterior teeth are bunched. From that time on, the case is treated exactly the same as any ordinary case of neutroclusion. In those cases where there is a protrusion of the maxillary anterior teeth, the molars and premolars are developed posteriorly in the manner just described, after which the nuts are allowed to stand away from the tubes on the molar bands, and the labial alignment wire rests against the maxillary anterior teeth. The canines are ligated to the labial alignment wire to produce expansion and the intermaxillary rubbers are worn to produce a posterior development of the maxillary incisors.

In all of those cases in which the maxillary anterior teeth are bunched, a lingual appliance and auxiliary springs can be used. The appliance can be soldered directly on the molar bands or it can be attached by any one of the many forms of lingual locks. The maxillary extensions are soldered on the buccal surface of the maxillary molar bands for the purpose of using intermaxillary rubbers that will exert a backward pressure on the maxillary molars to produce a posterior development in that region. A spring can be soldered on the lingual alignment wire to exert a backward pressure on the premolars so they will follow the maxillary molars in their posterior development. Any form of lingual appliance can be used.

The only caution to be used in the treatment of these cases is to be sure the mandibular teeth are stabilized in such a manner that the intermaxillary rubbers will not produce any perceptible amount of forward development. The molars and premolars of the maxillary arch must be retracted their full amount or the result will not be satisfactory.

These cases with improper treatment often produce an unsatisfactory result because the patient appears to have too many teeth.

NOTE.—This lecture was illustrated with about seventy-five lantern slides which cannot be reproduced.

DISCUSSION

Dr. G. W. Grieve, Toronto, Ontario.—I admire Dr. Dewey very much, and while I realize that he has had a vast experience, I am inclined to disagree with him on many points. I will discuss one point in particular.

In some of the slides we saw on the screen the mandibular canines were standing out of the line of the arch, and apparently the teeth posterior to these had drifted forward. Where similar conditions existed in the maxillary arches shown, Dr. Dewey talked of carrying the posterior teeth back to make room for the canines, but he carried forward the incisors to make room for the canines in the mandibular arches. The teeth had drifted forward in the mandibular arches in those cases just as they had in the maxillary arches. Why should the posterior mandibular teeth not be carried back to make room for the canines, to form a normal arch, rather than to carry the anterior teeth forward in order to make room for the canines?

Dr. F. M. Casto, Cleveland, Ohio.—Dr. Dewey showed the casts of a case in which all of the lateral deciduous teeth were in place and the mesiodistal relationship of these teeth was normal. The first molars had erupted and the cusps were in almost an end-to-end occlusion and might very easily lock abnormally. He stated that some one claimed this to be about the normal relationship in which the first molars erupt.

He also showed a similar case with the deciduous teeth in about the same relationship as the first case but in which the mandibular first molars had erupted and the maxillary first molars were coming down in a position which would probably cause them to lock in an abnormal mesiodistal relationship.

Now the point I wish to make is this, that frequently preventive measures may be employed to good advantage in these cases. I have observed many similar cases where the deciduous dentures were in a normal mesiodistal relationship but the mandibular second deciduous molars were of greater mesiodistal diameter than the maxillary second molars which presented the condition of having the distal surfaces of these teeth on the same vertical plane. Because of this when the first permanent molars erupted the cusps could not find a correct interdigitation and as a result they remained for a certain period in an end-to-end contact, but later, not infrequently, would settle down into an abnormal mesiodistal relationship. When this occurs the treatment of the case is considerably complicated. To avoid such an occurrence I have used the following methods to good advantage: first, by

grinding the distal surfaces of the mandibular second deciduous molars. If this does not allow the permanent molars to move forward enough to permit the correct interdigitation with the maxillary molars, then I place bands on these teeth (maxillary) with a distal contour sufficient to hold them far enough posterially so that the correct locking of the cusps may take place. In some cases I have had the mandibular second deciduous molars extracted which permitted the permanent molars to move forward enough to lock normally with the maxillary molars, after which they were retained in this position.

Dr. Martin Dewey.—Dr. Casto and I absolutely agree. I do not think he misunderstood what I said. I just did not say enough. His explanation is absolutely correct.

In all cases where you have deciduous molars, owing to the position of the maxillary and mandibular deciduous molars in straight line, the first mandibular molar must be held up and the cusps cannot drop to the normal position. If you grind off the second deciduous molar and allow the first permanent molar to drift forward, the cusps lock properly.

If the maxillary deciduous molars are lost before the mandibular deciduous molars, the mandible drops forward and it locks abnormally. That is not a case of posterior occlusion but simply drifting forward of the maxillary molar.

In regard to Dr. Grieve, he simply misunderstood. In places where the maxillary molars and premolars have drifted forward, we always move them back. The mandibular arch is not forward. The maxillary incisors are not moved forward. Your treatment is absolutely right, and the treatment we follow.

ORTHODONTIC STANDARDS*

By M. L. Tildesley,† England

ONE of the common unconscious activities of the human mind is the formation of standards. We receive impressions, we unconsciously group them, we unconsciously add up the frequencies with which different impressions are received, and, all things being equal, these frequencies tend to determine our standard of what is normal and right. And again, by a similar unconscious process, marked deviations from these standards may be recognized by us as abnormal and wrong. When, however, we endeavor to pass from recognition to definition, from unconscious and perhaps vague standards to the precise determination of standards on a basis of exact observation and sound logic, we are faced with a very difficult task. Orthodontists are familiar with the problem it offers, and are still grappling with it in their own subject. The contribution toward solving it which I shall attempt to make is borrowed from another branch of science.

We all recognize that the field of knowledge has become so vast today that the tilling of our own special sector is apt to demand all our energies and attention—we have little time for walking about and seeing what our neighbors are doing with theirs. And yet we also recognize that this diminution of neighborly intercourse, while it saves our time, is sometimes apt to diminish our profits. We miss the practical tips we might have picked up. And so if a neighbor passing by stops now to talk about the kind of fertilizer that other cabbage-growers have tried and found useful, it will perhaps not be unwelcome. Not even if she should also take upon herself to point out a few unnoticed caterpillars that are preventing the proper growth of some of your own cabbage-plants.

Three Basic Considerations Concerning Statistical Records.—Let me begin by propounding three fundamental considerations to which, I think, you will readily subscribe.

First, in orthodontics, as in other sciences, observations on individuals are only of value in so far as they tell us something about the group they represent. The statement that of twenty-six English schoolgirls of a given age, nine-tenths, say, had decayed first molars, would be absolutely uninteresting in itself. It would only become of scientific interest if it indicated that English schoolgirls as a whole tend greatly to have their first molars carious at that age. This principle is even true of anomalies. Why would the news of a human being with a tail a yard long at once provoke our scientific interest? Not because it tells us of him personally, but because we learn

*Transactions of British Society for the Study of Orthodontics.

†Research Assistant in Charge of the Human Osteological Section, Roy. Coll. Surg. Eng. Museum.

thereby that *mankind* is capable of producing a three-foot caudal appendage. It is always the truth about a whole group that the scientist needs, be that group broad, as "mankind," or narrow, as for example all toothless two-year-old blue-eyed orphans of Italian parentage.

The second fundamental consideration is this: Whatever the classification, the individuals that it includes will vary in every physical and mental character. The range of variation will in each case have limits, but will often overlap the corresponding range for other groups. Body length alone would serve to discriminate between a tiger and a titmouse, but not necessarily between a Scot and a pygmy.

The third is, that we rarely have the opportunity of examining all the individuals that would come into our classification, and can only try to get at the truth about them from samples. No two random samples will give us exactly the same result, but the larger the sample the more likely it is to be closely typical of the whole group from which it is drawn. Now for most of the characteristics with which we have to deal, quite elementary statistical calculation will be able to show how closely the results obtained from our measured sample are likely to be the facts concerning the whole group. And unless we can know this, our work is wasted. In practice, the degree of probability is indicated in a simple way that nonstatisticians can easily learn to interpret. Thus the average height of a sample series of twenty schoolgirls of a given race and age might be given in inches as "64 ± 1." The ± 1 would be the "probable error," and would tell us that with schoolgirls of this description it is an even chance whether a sample of twenty would give us the height of the whole group correct to within one inch, or whether the answer would be further out. Or it might be expressed "64, s.e. 1.5," in which case the value of the "standard error" (1.5) is given instead, and indicates that there are about two chances in three that 64″ is within 1.5″ of the correct answer. I repeat the facts about the actual sample have no importance of their own; only the facts about the whole group are important. Yet how many dental papers print tables and graphs showing percentages, and averages, and variabilities, of *samples,* with no indication whatever of what are likely to be the corresponding values for the *whole group* they represent.* This is worse than a waste of time and print; it is a prolific source of error, since it leads the uncritical reader (and writer!) to suppose that the values given may be accepted as true for the whole group, without further question.

But now, with these principles in mind, let us consider more nearly the question of orthodontic standards.

Theoretical Considerations as to Standards, and Practical Applications of Same.—As we have already to our hand a careful and detailed exposition of the views of the well-known German orthodontist, Dr. Paul Simon, on this subject, let us start with these and see how far we can agree and what we may wish to add. They are set forth in his book, *Fundamental Principles of*

*Of course, if they also give the individual values, or if they give other data from which the student himself can calculate the "probable error" of the result (for example, the mean, standard deviation and size of sample, where the distribution may be presumed Normal), then it cannot be said that they give "no indication whatever," and their data can be used. But only when these calculations have been made.

a Systematic Diagnosis of Dental Anomalies (first published, in German, in 1922), together with its appendix, "On the Norm-Concept in Orthodontics," which accompanied the English translation, published in 1926.

I have read this book with much interest, and with great respect both for the thoroughness of his biometic technic, and for much cogent and careful reasoning. The controversy and criticism provoked by this book naturally sharpened my interest. Simon examined the various considerations that might claim to determine an orthodontic standard. He finally concluded that though esthetic considerations had some importance, it was still more important that it should "permanently comply with anatomic and physiologic requirements, otherwise orthodontic efforts would be discredited."* In order to realize this aim he decided that the standard should be set by a group of individuals possessing a full complement of teeth that are "anatomically correct and healthy"—a group that incidentally would form a very small proportion of the population.

This group will, of course, show variation in every character except that for which it was selected. How, then, extract from these variable values, standards for the other characters? He recognizes the fact that they will in all probability be distributed according to the Normal curve, and says: "It is clear that these fundamental data of a mathematically conceived regularity are of the greatest biologic value in investigations of the apparently inextricable variability of the individual."† But in practice its value for him was largely lost through his inability to make use of its properties. Such a curve represents the group as a unit, and at the same time the ever-present variation in the individual values that compose it. He only knew how to sacrifice this property of variation and substitute for it a single value, that of the mean. If he had known how, he might have extracted from the data a more flexible standard and better suited to the varying proportions of the patients to be treated; a standard related to, but not limited to, the mean. It is easy to calculate the distance from the mean within which any given proportion of the population of a Normal curve will be found. The standard deviation, for example, marks the limits between which about two-thirds will lie, and you may, if you choose, take this two-thirds as your standard of "normality" and endeavor to bring more extreme deviations within these limits by orthodontic treatment. Or if you find it better to take a much more liberal estimate of what may be accepted as "normal" for any given character, and agree to regard as such nine-tenths of the whole group you are considering, then the standard deviation multiplied by about one and two-thirds (1.64 to be more exact) will give you the limit of their deviation from the mean value. This method of forming standards for practical application in diagnosis is one that the orthodontist would find useful, I believe. I would only remind him once more that they should be based upon data from samples that are reasonably likely to give him a close approximation to the facts about the whole group.

*p. 354 *loc. cit.*
†p. 357 *loc. cit.*

Let us now see whether Simon was aware of this necessity. I will quote what he says on p. 155: "One must seek persistently for persons with normal dentures and prepare the data very accurately. . . . The number of cases that one practitioner may chance to gather over a period of time is not sufficient for this purpose, hence national orthodontic societies should appoint permanent index commissions." Again, on p. 202: "To establish the position of the denture in the head cephalometrically, one must complete a considerable number of examinations of normal dentures with the aid of gnathostatic and photostatic investigation. The author regretfully admits that at completion of this book he did not possess a sufficient amount of material to permit him to draw certain general conclusions. All cases examined up to this time are in quite general agreement; hence one may hope that future disclosures will not alter the results thus far achieved in any appreciable manner, to say nothing of invalidating them. The overmuch cherished *a priori* supposition regarding a remarkably constant regularity of relations, finds its *a posteriori* confirmation in all investigations thus far conducted."

His "overmuch cherished *a priori* supposition" is the so-called orbito-canine law which has aroused such a storm of criticism. Again, on p. 138, we have a statement concerning it: "The orbital line intersects the dental arches on the right and left sides, as well the upper as the lower, at very definite points. In a large number of cases presenting normal occlusion a very definite relation between the dental points of intersection and the orbital plane is disclosed. . . . If these observations show, for example, that in dentures of European races the average of orbital intersection lies in the summit of the canine-cusp and that the vertical canine axis lies in the orbital plane, then this information constitutes a law, and the deviating relations found in individual cases may be judged thereby." You will find here no dogmatic assertion that this "law" does in fact exist for European races, the data being as yet inadequate. Still less does he maintain, as has been attributed to him, that in all normally occluded dentures the orbital plane he defines will pass through the tip of the canine cusp. It is only that he thinks, from his observations up till then, that that is probably its average position in German normal dentures. He had observed variation, but as we already know, he was unable to deal with distributions except to represent them by their mean value. Nor did he suggest a fixed relationship that would apply for all races, as some have rashly assumed. He says (p. 200): "We must recognize ethnographic divergence. . . . Dental normality of German individuals alone will be considered in this book."

I confess that in all this I find little to quarrel with. Simon recognized the necessity of adequate observations for obtaining his means. At least he did in theory! In practice I find to my astonishment that he was content to use standard horizontal, sagittal, and transverse curves that were averaged from only three and four individuals! And yet his previous references to "a very large number of cases presenting normal occlusion" suggests that he had more than four cases available from which he could have calculated his norms. Another surprising fact is that these standard curves, being the average for three (in one case four) individuals, each aged fifteen years (see p. 146),

should be used by him, in practice, as standards by which to estimate the normality of individuals ranging in age from seven years to twenty-seven (pp. 262 to 317). Yet even if the average orbitocanine relation held good for all ages, as his observations suggested might be the case, sagittal sections through the palate would surely show age changes! What is true of one age is not necessarily true of another; what holds for one sex does not necessarily hold for another, observations on one race cannot necessarily be applied to another —all these are cardinal principles in biometric work.

Let us turn again now to that vexed question of the orbitocanine plane. We have seen that Simon's conclusions as to its average position in the German face were only tentative, awaiting further confirmation. In the Appendix published to the 1926 English edition of his book, however, Simon was able to quote the result of researches by Herzog on this question of the mean position of the orbital plane on German individuals of mixed ages. I have not been able to find a copy of this paper in London, so must assume provisionally that the definitions and technic employed were exactly the same as Simon's, though of course one can never take these things for granted without verification.* Herzog had examined 100 children ranging in age from five to fourteen years, and 37 adults—making 137 individuals in all. In 47 per cent of these cases the orbital plane passed through the summit of the canine cusp, and in a further 32.4 per cent through some part of this tooth: only in 20.6 per cent did it fail to touch this tooth. No probable errors of these percentages are given; but the sample is of respectable size, and if the ages are well assorted, or if Simon should be right in supposing the relationship unaffected by age, the distribution in the sample would probably be much the same as that in the group it represents. Simon, finding in this an "*a posteriori* confirmation" of his "cherished *a priori* supposition," now states his belief with correspondingly greater assurance.

In making this survey we have been able to consider a number of points bearing upon the choice and use of standards. Incidentally, we have also been appraising certain aspects of Simon's work, and it would therefore be of interest to see what some others think of it. Milo Hellman gives us his views in a paper published in the INTERNATIONAL JOURNAL OF ORTHODONTIA, RADIOGRAPHY, AND ORAL SURGERY in February of this year (1930). He states (p. 152) that "no one with practical experience in anthropometric procedure shows any disposition to take Simon's conclusions seriously. Thus Connolly, Broadbent, Wolfson and Oppenheim, who have done extensive researches of a similar kind, not only fail to verify, but definitely refute the basis of Simon's conclusions."

As far as I have studied the work of these various writers, their criticisms are not directed against the general basic considerations discussed above, but are confined to two matters. One object of criticism is the belief Simon expressed concerning the position of the vertical transverse plane through the

*Since writing the above, I learn from a comment in the Deutsche Monatsschrift für Zahnheilkunde, December, 1930, p. 1541, that Herzog did *not* use Simon's gnathostat, but an apparatus called the Orbitalbrille (orbital spectacles). This makes it the more necessary to verify the assumption that the determinative points used by both workers were exactly the same, and the results of the two proceedings absolutely comparable.

orbital point; the other is the clinical treatment he recommended for certain cases. Clinical treatment is outside my province; but it might be worth our while to spend a little time in discussing some of the anthropometric evidence these writers assemble as to the position of the orbital plane. The question is one in which orthodontists have shown considerable interest, and the discussion may serve to illustrate certain principles which are important in anthropometry. It would take us too far afield now to study in detail the published papers of all those whose names Hellman quotes. We can, however, examine the results obtained by two of them, Broadbent and Wolfson, who test directly the position of the orbital plane in adult skulls. The others adopt indirect methods of investigating the truth of Simon's thesis, and with their work I propose to deal in a separate paper.

The Position of Simon's Orbital Plane.—One of the cardinal principles of anthropometry, as taught by the biometric school in which I received my training, is that in publishing measurements one must also exactly define them; the fellow-principle is, that before using for comparative purposes data published by others, one must always look up their own definitions of the measurements they record, to see whether the various records are in fact comparable. If definitions are vague or lacking, the figures must be used with great caution, or perhaps not be used at all. Racial anthropometry has frequently led in the past, and still too often leads, to conflicting or unsound conclusions through neglect of these elementary rules. Let orthodontists take warning, and avoid this pitfall in their own use of anthropometry! But now to Simon's orbital plane: he for his part has carefully defined the plane and described the technic by which he establishes its position. It is for us to do our part by ascertaining as exactly as possible, before we begin discussing it, what it is we are discussing.

Simon defines his orbital plane as at right angles to his horizontal and sagittal planes (previously defined by him), and passing through his two orbital points, or, if one lies further anterior than the other, then through the point where the line joining them passes through the sagittal plane. The orbital points are determined by palpation of the orbital margin and then marked on the skin. They are defined as follows (p. 90): "The gnathostatic orbital point lies on the (uniformly very thin, that is, not puffed) skin at the lower bony margin of the orbit and perpendicularly below the pupil, when the head is in proper balance and the eye fixed at a point straight ahead. Thus the gnathostatic, that is, *cephalometric* point, is not identical with the *craniometric* orbital point: the latter lies at the lowest point of the orbital margin and consequently more to one side." His horizontal plane was determined, he says, by these two orbital points and the two tragia,* and in orientating the gnathostat to this plane he made his orbital pointers touch the skin thus marked. A vertical edge 1 cm. long descended from the tip of each

*It is of course impossible to ensure that four points shall all lie in one plane; the maximum number one can use in defining a plane is three; and later on, in describing the orientation of the head for the photostat (p. 120), he uses only three, namely, the left tragion and both orbitalia. The fact of his using four with the gnathostat suggests that the tragia were not marked beforehand, and that he allowed himself some margin in determining exactly where his posterior pointers should rest.

pointer to prevent it from entering the orbit, and this vertical edge was pressed as hard against the face as was possible short of discomfort.

Let us now see exactly where the point of our pointer will be resting relative to that part of the bony margin of the orbit which was palpated to determine the orbital point marked on the skin. First we must notice that the margin of the orbit in this region does not project so far forward as the bone immediately below it. The vertical edge we have described will therefore be brought up against this more projecting surface of bone, and will cause the point of the orbital pointer to come to rest a little distance anterior to the orbital margin. Again, we have not only a covering of skin and fat over the orbital margin and the projecting surface below it, but we also have the thin *orbicularis oculi* muscle covering both. We have to estimate the thickness of this skin, fat and muscle when the living tissues are pressed against the bone by the vertical edge of the orbital pointer, or else are pressed down upon the orbital margin by the palpating finger of the operator. In the preserved specimen the tissues are already hard and cannot give us a direct measurement. Sir Arthur Keith estimates, however, that the combined thickness would be about 2 to 2½ mm. Let us choose the lower figure, and reckon that the vertical edge will be approximately 2 mm. anterior to the projecting bony ridge below the orbit, and that its point, when brought level with the orbital point defined by Simon, will be about 2 mm. higher than the bony margin itself. The horizontal plane having been defined by the pointers (right and left) and by the tragia, a plane vertical to it is drawn through the points of the orbital pointers (slightly adjusted in the case of asymmetry, as previously explained, but the slight asymmetries would probably cancel each other in a series, and we will in any case disregard them in our present calculations).

This, then, is Simon's orbital plane. He warns us that the orbital point used to determine both it and the horizontal plane is not the same as the orbital point used by craniometrists. It is important to examine the relation between them. The Frankfort horizontal of the craniometrist is determined by the two poria (whose level on the skull is stated by Rudolf Martin* to correspond as nearly as may be with the level of the tragia on the living head), and by the lowest point on the margin of the left orbit. As Simon has mentioned, this point lies "more to the one side" than the *cephalometric* orbital point which he has used. Since the orbital margin as a whole itself slopes slightly backward from the position its inner portion occupies, the lowest point on its margin is not only lower than that selected by Simon but is also situated further back, as viewed in *norma lateralis*.

Assuming therefore, that the tragion on the living and the porion on the skull supply us with approximately the same starting point for our cephalometric and craniometric horizontal planes, let us compare the direction taken by the two straight lines drawn thence on a left *norma lateralis* to the two different orbital points, and after that the direction of the lines drawn

*Lehrbuch der Anthropologie, vol. 2, p. 618, 1928.

respectively vertical to them. As to the first two lines, that for the living head will reach further forward than the other, first by reason of the more anterior position of the part of the margin selected, second by the still more anterior position of the bone immediately below the margin, third by the skin, fat and muscle, estimated at about 2 mm., which covers this bone. Even if the two lines lay in the same horizontal, a vertical from the cephalometric

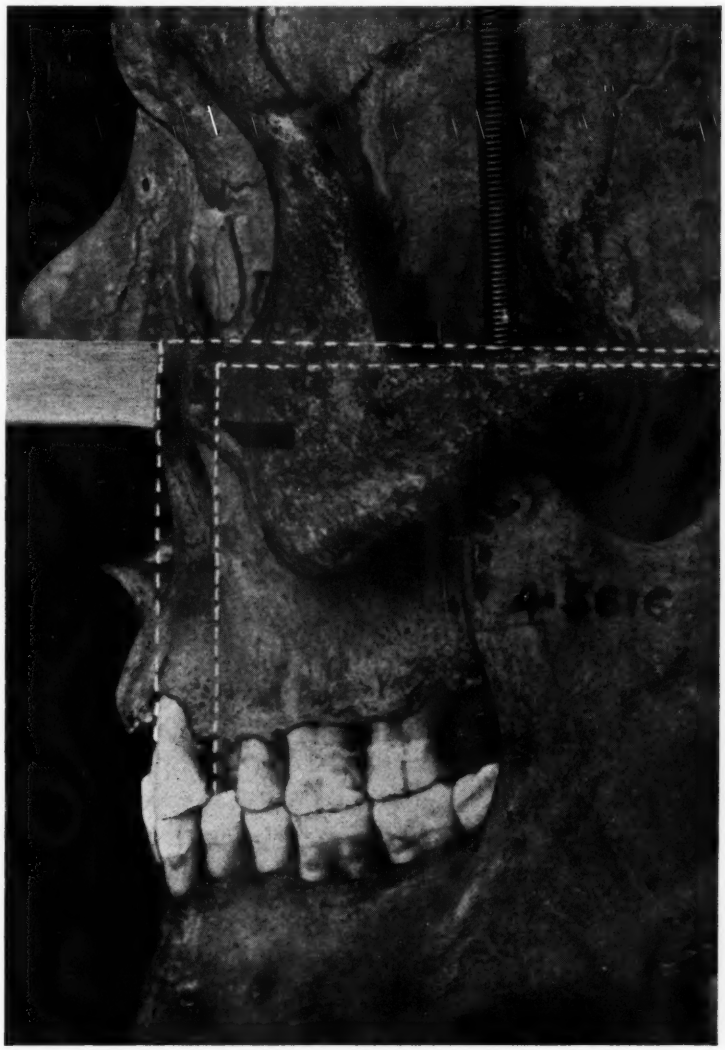


Fig. 1.—To show relative positions of Simon's (above) and the Frankfort horizontal (below), and of their respective orbital verticals, on a sample skull ($\frac{1}{1}$).

orbital point would pass through the upper denture at a point anterior to the corresponding vertical through the craniometric. But they are not on the same horizontal. The point of Simon's pointer is higher than the craniometric orbital point, first by the amount of rise of his part of the margin above its lowest point, second by about 2 mm. of skin and muscle which interpose between the margin and the finger pressed down upon it. This relative upward tilt of Simon's horizontal will necessarily throw his vertical slightly

further forward and add a little more to the distance which divides its point of emergence on the dental border from that of the craniometric vertical.

The relative positions of these various points and lines as identified on a male British skull in the Royal College of Surgeons Museum is illustrated in Fig. 1. This skull has not been chosen as "typical": it has no more claim than has any other single specimen chosen at random to represent the group to which it belongs. It was the first skull I came to that fulfilled the conditions of being male, in good condition and with most of the teeth present on the left side. The tip of the wedge of black plaster seen on its malar bone rests on a point vertically below the craniometric orbital point, and was put there to make the exact position of this point clearer in the photograph.

Let us now turn to Simon's critics.

We will take first Broadbent's refutation of Simon, published in the *Dental Cosmos* for 1927, Vol. LXIX, p. 799. He tested Simon's conclusions by measuring a series of seventy-five skulls of whites (presumably adult) of mixed nationality having "correct occlusion." He orientated the skulls to the craniometric Frankfort plane, and measured the distance between the tip of the canine cusp and the point at which the vertical plane through the craniometric orbital point cut the dental arch. He gives the means, variabilities and percentages for his seventy-five specimens, though without any accompanying indication of how likely they are to be the same as the corresponding values for the total "male white" population from which they are drawn. But even if they may be accepted as an exactly representative sample, and even if the mixed "male white" population of the United States were of the same race as the subjects measured by Simon and Herzog, there would be no cause for astonishment in the discovery that the average position of this point in Broadbent's series was 9 mm. behind the tip of the canine cusp: as we have seen, this vertical plane must always fall some distance behind Simon's.

It would, however, be unfair to put upon Broadbent the whole blame for failure to realize that the two planes were not the same: this must, in fact, be shared with Simon himself. The only account of the latter's methods which had come into Broadbent's hands at the time when he began his investigations, was a lecture delivered by Simon in America and published in the International Journal of Orthodontia, Radiography, and Oral Surgery in 1924. It was, of course, impossible for Simon, in one lecture, to go fully into all the points dealt with in his book, as he himself reminded his hearers. But it was unfortunate, as events showed, that there was in his lecture no word to suggest that his findings were limited to any particular racial group. It was more unfortunate that his account, on this occasion, of the horizontal plane to which the gnathostat was orientated, not only omitted to warn against confusion with the Frankfort horizontal used by craniometrists, but actually contained some misstatements. His account was as follows: "A gnathostat model is marked after three determined planes of the head or skull. The upper plane of the model is identical with the so-called 'Frankfort horizontal plane,' or, as it is more shortly called, the ear-eye plane. Im-

agine this plane to be a section made through four points of the head, viz., the two orbitalia or eye points, and the two tragia or ear points; the former are situated on the lower edge of the orbit just below the pupil, if the patient is looking straight ahead. The ear points are situated on the upper end of the tragus. This ear-eye plane is, therefore, of great importance, and has for the last forty years been of great significance also in anthropology, on account of its being the physiologic horizontal plane; that is to say, if somebody holds his head erect in equilibrium, that plane is absolutely horizontal'' (p. 757, *loc. cit.*).

It may be mentioned in passing that the last statement, as it stands, is certainly incorrect, and falls into the same fallacy-breeding category as the ''constant position of the first molars,'' or the ''constant position of the orbital plane,'' or in fact any alleged constancy in inconstant humanity! The ear-eye plane was selected as determining the horizontal, because it was observed that it lay approximately horizontal in most individuals who were asked to stand upright and look at an object some distance away and at their own eye level. Its absolute horizontality is a ''fiction'' such as Simon himself discusses: it is necessary to select some plane that shall be treated ''as if'' it were constant, in order to have a plane of reference by which to measure the variability of other characters.

It was, however, the earlier part of the passage quoted which led to the misunderstanding between Simon and his American critics. His plane was *not* ''identical with the so-called Frankfort horizontal plane,'' nor had it been used for the last forty years, whether on skull or on living head. Anthropometrists determine the Frankfort horizontal by reference to the *lowest* points of the orbits. In a later paper Dr. Simon points out that ''the ear-eye plane of the skull is a different plane from the ear-eye plane of the head*—and, we may add, especially if it is defined by the orbital points he selects instead of those in general use on the living—but anyone reading the statement that ''a gnathostat model is marked after three determined planes of the head or skull'' would have some excuse for supposing they were the same thing. There was, however, one signal set against this conclusion, full in the sight of all familiar with skull measurement: ''the two orbitalia . . . are situated on the lower edge of the orbit *just below the pupil, if the patient is looking straight ahead.*'' If this danger signal had been heeded, it would surely have led to further investigation of what Simon really meant, as he himself requested when the subsequent discussion showed that certain points in his lecture had been misunderstood. Apologizing for his imperfectly spoken English, he said: ''I am glad that it is not necessary for me to answer all the points that were touched in the discussion, because all opposite meanings which are possible in this subject have been already discussed in my book and in the other book which I will present to you. I hope that these two books will be translated into English during the next month, and I beg you all, as far as you are interested in this work, to read them, and, of course, to

*Internat. J. Ortho. Oral Surg. and Radiog. 14: 151, 1928.

read them not only once but three times'' (p. 784, *loc. cit.*). They appeared in English in 1926, the second as appendix to the first.

It remains to inquire whether the whites of mixed origin on which Broadbent worked would have been accepted by Simon as fit subjects for testing the ''canine law'' which he had tentatively propounded in 1922, but, as we have seen, subsequently enunciated with greater confidence. In his appendix ''On the Norm-Concept in Orthodontics'' in 1926, the only further data that he quotes in support of his conclusions are the figures obtained by Herzog, and both these and the four years' further experience which he himself had then had were presumably obtained in Germany. Our quotations have shown, however, that already in 1922 he contemplated the possibility of the canine-orbital relation constituting a ''law'' for ''European races,'' and as his American lecture was addressed to an audience that would obviously not be concerned with patients of German descent alone, we may infer that the omission to qualify his remarks in this sense was deliberate. He probably, therefore, did expect his ''law'' (which his lecture did *not* omit to explain as an average) to hold good for the mixed white population which was represented in Broadbent's material.

It would be interesting to know where Simon's vertical plane would have fallen on Broadbent's series; and what is the order of relationship between the two planes. Evidence on this point is forthcoming in regard to a series of British skulls, and I am greatly indebted to Dr. Wilton Marion Krogman, who has kindly permitted me to give here some results he has not yet published. In the absence of flesh it was, of course, impossible to get more than an approximation to the exact position of Simon's cephalometric orbital point and the tragion, in relation to the skull. A fixed allowance of exactly 2 mm. in two directions was made (as described above) for soft tissues covering the bone bordering the orbit, and the tragion was assumed to lie along the line joining porion to the orbital point thus determined, in *norma lateralis*. Of course, even if these estimates should give as absolutely correct the *mean* positions of the points in question, they will represent no constant values in the individual head. But, having no clue to the individual variations, the best one can do is to substitute the best available estimate of the mean value.

Dr. Krogman's measurements were taken on all those adult male British crania (89), of any period in the museum of the Royal College of Surgeons of England, which were sufficiently complete to orientate on the Reserve Craniostat, and had the maxillary left canine, premolars and first molar present at death, and at least the canine and second premolar still present in the museum specimen. Teeth being frequently missing in skulls that are recovered from graves, it was impossible to get a series of sufficient length without mixing the periods. The distribution of individual values for the character he measured was, however, found to give a good fit to the Normal curve. Comparative material in the shape of similar observations on racially more homogeneous series will show later how the variability of this mixed British series compares with others. The position of Simon's cephalometric point was determined in the manner described above, and on the left *norma lateralis*

lines were drawn to the upper dental arch from this and the craniometric orbital point, at right angles respectively to the lines joining them to the porion (as in Fig. 1).

The tip of the canine cusp being worn away in many of these crania, Krogman took measurements to the posterior border of the canine instead.* The craniometric vertical was found to pass through the dental arch at a mean distance of 5.74 ± 0.24 mm. behind the canine and 10.00 ± 0.09 mm. behind the cephalometric vertical. The mean position of the latter, being just over 4 mm. in front of the posterior border of the canine as seen in *norma lateralis,* obviously falls very close to the tip of the canine cusp, in this adult British series of mixed periods. The fact that the mean position of the craniometric vertical in Broadbent's series of mixed-white adult skulls was 9 mm. behind the tip of the canine cusp, and in Krogman's 5.74 mm. plus the width of the canine, suggests (though it does not prove) that, in Broadbent's series also, the mean cephalometric vertical would probably cut the dental arch practically at the tip of the canine cusp.

Let us now turn to Wolfson's contribution to the orbito-canine discussion. Whatever vertical relationships may prove to be common to all orthognathous races, it is obviously unlikely that racial prognathism would leave such relationships unaffected. It is, therefore, difficult to see exactly what contribution could be made to science by averaging the distance between the canine and any vertical plane whatever, on a mixed lot of human skulls belonging to races that are prognathous to any degree or to none, and are assorted in unknown proportions. This, however, constitutes two-thirds of the material on which Wolfson refuted Simon's conclusions, in a paper published in *Dental Cosmos* in 1927, p. 341. Twenty of his skulls were American Indian; the origin of the remainder is not specified, except that they were from the American Museum of Natural History, which doubtless collects skulls from all over the world. These forty might have been anything—and probably were! Wolfson orientated them on plasticine, so that the "sagittal plane" (not further defined) was parallel to the table.† The uppermost porion and orbital point—which together gave him his Frankfort plane—may or may not have been vertically above their respective partners in this position; we incline, however, to the latter. He projected these and other points upon the table, including "the highest point gingivally of the enamel crest" of the canine. He found that this point lay on an average 12 mm. behind the perpendicular drawn from the craniometric orbital point in his twenty American Indians and 11 mm. behind in his forty mixed. It is obvious that these findings neither refute nor confirm Simon's. Nor have they any value at all except in so far as Wolfson's technic can be accepted as giving exact and reliable figures for a small sample of American Indians of assorted sexes, and it is just on this point that we are beset by doubts.

*He measured the distance between the craniometric vertical through orbitale, and the vertical tangent to the posterior border of the canine.

†The sagittal plane used by Broadbent would be at right angles to the auricular axis—the nearest thing that can be got on the craniostat to the line joining the two poria. Simon's sagittal plane was at right angles to his horizontal plane, already defined.

We have seen that there was considerable excuse for Broadbent's and Wolfson's supposition that Simon's orbital point was the one used in craniometry. Hellman, however, when writing the article which appears in the February issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY for 1930, had Simon's book in his hands and himself refers us to it. He also refers us to Connolly. Now Connolly had written a paper which appeared in 1927 both in the *American Journal of Phys. Anthrop.* and in the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY, and he had made a second contribution to the latter in 1928. This was in reply to, and was published together with, Simon's criticism of the 1927 paper. Simon points out that Connolly has confused the cephalometric with the craniometric orbital point, and quotes from his book a warning against this mistake. Connolly replies that his interpretation was based, not on Simon's book, which he had not then seen, but on his American lecture. Anyhow, the point is cleared up in these two communications. It is, however, notoriously difficult to overtake an error when once it has been given a good start; and so we find Hellman, in 1930, still reporting observations on the position of the vertical plane through the craniometric orbital point, as refutation of Simon's thesis. He gives detailed results, obtained independently by a different technic, for thirty-four of the adult white skulls that Broadbent had already measured, and states (p. 154): "None of the skulls shows any relationship between *orbitale* and canine point. On the contrary, *orbitale* falls behind the canine in all instances and varies widely." Hellman, I understand, is now aware that he and Simon were referring to two different points. (This does not alter his view of Simon's conclusions, which he contests strongly on other grounds.) I take, however, this opportunity of clearing up the misunderstanding in so far as it still exists in the minds of any I am now addressing.

We are obliged to defer till another occasion an analysis of the other investigations contained in Hellman's paper, namely, those determining the position of the orbital plane on nonwhite adult material, those recording growth changes in its position, and those dealing with orbitodental relations by other methods. And the question of the particular orthodontic standard proposed by Simon must now be temporarily abandoned for more general aspects of our subject.

Selection or Nonselection of Material.—Orthodontists seem to be generally agreed that standards of "rightness" should be based upon data obtained from series of individuals who themselves satisfy the observer as being "right." I have sometimes wondered, in reading through orthodontic literature, whether the criteria are always the same, whether the "normal occlusion" of some writers is the same as the "perfect occlusion" of others, the "anatomically correct and healthy," and so on. You may be in a better position than I to say whether the criteria applied by different workers vary, or not. In any case we may safely say that if it is important to select one's material according to certain orthodontic requirements, it is important also that the same criteria should be used by all orthodontists whose results are

to be compared together; otherwise there is the same danger of confused argument, at cross-purposes, as we noted in the case of anthropometric measurements. But what I want to suggest to you now is a certain alternative to selection, or at any rate to such stringent selection as some orthodontists carry out. If jaws could be taken just as they come, except perhaps those that have had the course of nature modified by extraction, it certainly would be a great convenience to the research worker. Linder and Harth, for example, in a recent investigation, examined more than 2,500 persons in order to get 150 with "faultlessly articulating normal-bite."* I would like to invite your attention to two type-silhouettes of University College (London) undergraduates. These represent the average of fifty males and fifty females respectively, all of them English, but absolutely unselected in regard to physical proportions—ugly and beautiful, slim and stumpy, all taken just as they came. And the results are two very attractive and handsome profiles, which no orthodontist would hesitate to acclaim as typical for his ideal occlusion.† If the average of an unselected series can give us such results as these, is it necessary to seek out at great labor individuals conforming to our own specification, in order to obtain our standards? Let us see if we can analyze what lies behind the fact that these silhouettes satisfy us esthetically. We must put aside such considerations as the objective reality of beauty and our own recognition of it; not that it does not exist, but that this factor is not susceptible of scientific investigation. There is, however, another factor which can be analyzed. In my opening remarks I referred to our unconscious formation of standards by the equally unconscious process of adding up our impressions. I was, of course, careful to say "all things being equal," because the influence of frequencies upon our unconsciously formed standards, though usually strong, is not determinative. Thus in the realm of pictures or of house-furnishing, our tendency to accept standards accepted by the majority of our neighbors may be interfered with by our own superiority-complex, say, or by our uncommon sensitiveness to what is truly beautiful. The influence of some other personality at a receptive moment may forever queer the answers to any unconscious addition sums, or at any rate our reaction to the results. These factors, however, are erratic in their action; the tendency which I have described is steady, and we see it reflected in the remarkably uniform tastes of the majority in any localized group. When we come to standards for judging good looks, erratic influences are likely to have less weight than in the other fields of appreciation that I have mentioned, and our standards will all the more rest upon a basis of summing up and averaging the faces we see as we go about the world. When we see a person with a nose larger and heavier than the average, we decide it is too big and the person ugly; a mouth differing considerably from our average for mouths is too wide, too small, and so on. And if my analysis of a part of our mental processes is correct, it does much to explain why, when we are shown a concrete presentation of the average of our experience, we hail it as beautiful.

*Misch, Die Fortschritte der Zahnheilkunde, V. 821.

†These profiles were thrown on the screen during the lecture. They are published in Biometrika, XXB (1928), opp. p. 400.

Also, although I know of no objective reason why the type silhouette of the West African negro should be really less beautiful than the English silhouettes which it accompanies, my analysis would explain why we think it so. But we shall probably allow that this negro is good-looking as negroes go, if we have seen enough negroes to form unconsciously an average.

We may take it, then, that the average of an unselected series would satisfy esthetic requirements in orthodontic practice.* In regard to the weight that should be given to considerations of anatomic correctness (as apart from functional efficiency): supposing that the average denture in a given population did in fact depart so widely from "anatomical correctness" that it could not be accepted as a "correct" standard, would it not be an almost hopeless task for orthodontists to attempt to get so wayward a majority back to the standard that they in their wisdom had selected as anatomically correct? From a practical point of view, it does seem more hopeful to aim only at the less exacting standard that I suggested before, namely, at the nearest point of that fence which encloses the middle nine-tenths of the population, say, and separates them from their more extreme brethren.

Correlation.—Up to this point we have only discussed the formation of standards for single characters considered without reference to others. Harmony and proportion are, however, the real aim of orthodontics, whether from the esthetic, anatomic, functional or any other standpoint. I have dealt elsewhere with the considerable service that anthropometry and the science of statistics could render to the practicing orthodontist from this point of view.† By working our correlation coefficients from adequate data, one could supply the orthodontist with charts which would tell him to what extent a given anteroposterior position of the maxillary incisors, say, was *unusual in combination with other characters*—with the anteroposterior positions of the nasion and subnasal point, for example (or any other points that might be preferred). Then, if by any chance a Class II case should turn up having a forward thrust of the maxillary incisors such as would not be found in one in a hundred faces with the given position for nasion and subnasal point, and at the same time a backward position of the mandibular incisors that would be reached in such a face more than one time in ten, it would obviously be the maxilla that was contributing more to this disharmony. But of course I shall not be so rash as to assert, in default of evidence, that this particular combination does occur. Nor shall I expose my defenseless ignorance to the fury of any particular school of clinicians by suggesting that the maxilla should be tampered with even then! I merely mention that it would be quite possible to prepare such charts for any given population as aids in accurate diagnosis.

Conclusion.—If, in conclusion, I might be permitted a few positive recommendations, one would be that the word "constant" be permanently banished

*If the distribution should prove to be asymmetrical, one might adopt the "mode" instead of the mean.

†Orthodontic Problems and their Solution, published by the Dental Board of U.K. as appendix to the Ætiology of Irregularity and Malocclusion of the Teeth, by Prof. J. C. Brash, 1930.

from the orthodontic vocabulary; also a long sentence upon the word "law"; and one of, let us say, five years upon "normal." At the end of that time "normal" might be returned to freedom, but only on the condition that it never again lent itself to imposture in connection with the "mean."

Finally, anthropometry and statistics are not orthodontia. But they constitute an avenue of orthodontic research; and unless the technic be sound, unless the data recorded be accurate, unless the interpretation of the data be soundly based, the avenue becomes a series of pitfalls, in and out of which the exploring orthodontist flounders forward, when he might be moving surely and steadily toward his goal.

DISCUSSION

The *President* then declared the meeting open for discussion. He asked Miss Tildesley whether in her opinion cephalometric measurements and classifications based on them could possibly be of any value at all as opposed to craniometric measurements. Measurements taken from points in soft tissues, and angles calculated from lines drawn between such points could not, he thought, possibly be of any value.

Miss Tildesley replied there was no doubt whatever that it was impossible to attain on soft tissue the same standard of accuracy as on bone. Nevertheless, orthodontists had to deal with living persons, and so, if they were going to use measurements at all in diagnosis, they must be measurements on the living. There was, however, a means of testing whether any soft-tissue measurements could be made sufficiently accurate to be useful: Two persons who were trained in the same technic measured the same series of persons independently, and repeated the same measurements after sufficient time had elapsed to enable them to forget the values they had recorded on the first occasion. The difference between the readings should be worked out as a standard deviation of error. Supposing that the difference between the mean values in different groups for any given character had been found to be 10 mm., and that the error of observation was likely to produce an inaccuracy to the extent of 2 mm. This difference of 2 mm. would not mask the real 10 mm. difference. If, however, the differences between the subjects were only of about the same order as the differences between the observations, measurement failed in its object. This constituted a perfectly objective test that could be applied to check cephalometric measurements; the pity was that people did not use it.

Dr. W. M. Krogman added a tribute of personal appreciation to the paper contributed by Miss Tildesley. He then spoke of the validity of the correlation between the measurements on the living body and those on the macerated skeleton. He had, he said, had the privilege of being associated with Dr. T. Wingate Todd, of Western Reserve University. There, in the Anatomical Laboratory, were housed some 1,800 skeletons, the exact age, sex, and stock of which were known. In handling this material as it went through the medical school it was first measured in accordance with standard anthropometric technic. After maceration all anatomic landmarks were translated if possible, into terms of the bony landmarks. By this means the nearest possible approximation was made—of course with an inherent recognized error—to the measurements on the living. The transition from the dead body to the bony skeleton was first ascertained, and then, by correction, the measurements on the living with reference to the bony framework were approached with a considerable degree of accuracy. As an illustration in point, Dr. Krogman called attention to the measurements made to determine the so-called cephalic index: relation of the length to the breadth of the skull, an index which is convenient for a rough classification of races. A great deal of such work had been carried out on both the living and the dead by independent investigators. The question immediately arose as to whether this data was comparable. Arising from this problem had come the research into the thickness of the cranial tissues, so that a given measurement on the living head might be stated in terms of measurement on the macerated skull. In other

words, a correlation had been worked out between the measurements of the living and the skeletal populations, assuming that both were of the same race and vicinity. Dr. Krogman then referred to another problem, which, although apparently irrelevant, certainly justified mention. This was the tendency of modern research, in any kind of scientific problem, to include the data of all related disciplines. Miss Tildesley had demonstrated that the study of orthodontics might well utilize the tool of statistics. Yet another tool might be useful in that study, viz., comparative anatomy. For the past years he had been working in the fields of comparative anatomy and comparative racial anatomy, i.e., physical anthropology, in association with Dr. W. K. Gregory, Dr. Milo Hellman, and Dr. T. Wingate Todd. These men have been working on the general assumption that man, taking his place in the animal kingdom, is subservient to the same growth rules that govern the entire kingdom. Therefore, if search be made for a fundamental mammalian pattern, man must necessarily be governed by that pattern. Similarly, specializing further, he must be governed by a primate pattern, and finally by what has come to be termed an anthropoid pattern. Thus it is customary, when dealing with the variations of human anatomy—and especially of human growth—to refer to the "anthropoid strain" which has lingered in the human body, and may be responsible for certain aberrancies in growth. To give one example: man possesses the same number of teeth as the anthropoid apes; he has diminished the size of his jaw and also the size of the teeth. The interesting point is, however, that the decrease in the size of the teeth has apparently not kept pace with the decrease in the size of the jaw. Therefore, arising from this anthropoid heritage might come—he said "might" because they were not yet certain—the factors which predisposed to crowding in the dental arch. This research simply illustrates one general tendency of the interpretation of various phenomena of human growth, namely, that the human individual, as he grows, has not only a pattern unique to him as a human, but also a pattern which has been laid down far back in his phylogenetic history and which kept pace with the development of a generalized mammalian pattern, a more particular primate pattern, and, finally, an almost immediate anthropoid-ancestral pattern.

Mr. H. Chapman remarked that the point in Miss Tildesley's paper which had particularly interested him had been her explanation of the differences between Simon and some of his critics which seemed to be the critics' difference between the craniometric orbital point and Simon's orbital point. She had shown most clearly how some very slight variation in the angle between the Frankfort plane and the orbital plane could disturb the diagnosis if the practitioner made any error in selecting the orbital point. He asked Miss Tildesley whether the two halves of the Frankfort plane were in the same plane or did they meet at an angle.

Miss Tildesley replied that the Frankfort plane did not possess two halves but was always a single horizontal plane. It was impossible to define one whole plane by more than three points, as there was no guarantee that a fourth point would lie in the plane. When the craniometrist used the Frankfort plane he used the two poria and the left orbital point. He could not say that he must have both orbital points. Simon had been very careful in his descriptions and definitions, but he had made the queer mistake—queer, because he had avoided this pitfall in other directions—of defining his Frankfort plane by both poria and both tragia. This could not be done. She had, however, never heard of anyone using different planes for the two halves of the head.

Mr. Chapman said that he had used the term of two halves to clarify his meaning, but Miss Tildesley had fully answered his question; he thought it likely that as the Frankfort plane did not pass through both orbital points the orbital plane would probably not pass through the canine at the same point on both sides.

Miss Tildesley said that asymmetry was the rule.

Mr. Chapman then remarked that he was glad that Miss Tildesley had used the expression "Class I," for it made it easier for him to ask another question. Was the ear and the orbital point from which Simon made his diagnosis, free from those errors of growth which

characterized the arches, maxillae and other components in Class I cases, and could these points be used with satisfaction as fixed definite standards from which a vertical plane might be made?

Miss Tildesley replied that there were no constants whatever in the skull. In the body, all was relativity. Supposing, however, that it were required to discuss the variability of some character, the investigator was compelled to consider some point as fixed and to work out the variability with regard to that point. Otherwise, he could work out nothing. Whatever point he selected would be subject to its own variation. It was presumably desirable in orthodontic treatment to redress disharmony between the upper and lower jaws in such a way as to attain as much harmony as possible between the region of the jaws and the upper part of the face. If the position of any one point were to be selected as criterion of the degree of forward thrust of the upper face as a whole, she thought the choice of the orbital point was sound enough; but it must not be presumed that the orbital point was infallible, nor that it maintained an invariable position in regard to the rest of the upper face. It might happen that the jaws were more in harmony with the rest of the face and the orbital point at fault. In practical work that reservation would have to be made. But the replacement of a rigid standard by a more flexible one of the kind described would lessen the difficulty. Also Simon said—and it was quite reasonable—that in his diagnoses he did not regard any of his various standards as ultimate or only standards; he made a balance of different standards.

Mr. Chapman confessed that he was not clear whether this orbital point was not as abnormal as the Class I cases themselves, or, to be more concrete, as the position of the canine in Class I. He asked whether one abnormality was not being used to diagnose another.

Miss Tildesley asked whether Mr. Chapman meant that the two abnormalities usually came together.

Mr. Chapman suggested that if the definition of Keith and Campion of the masticating face were accepted as applying to Class I cases, it was necessary to regard the two as abnormal.

Miss Tildesley said that Class I cases were usually regarded as due to local defects rather than to a more general disharmony, and in that case she presumed that this class of abnormality would not greatly tend to be associated with defects and in the orbital region.

Mr. Chapman said that he had been very much interested by the profiles thrown on the screen; he supposed that they would almost represent the profiles of normal occlusion from the orthodontist's point of view. It would be very extraordinary if Miss Tildesley, in her random selection, had been able to obtain so many practically-normals. He had with him, strangely enough, a note from Mr. Friel received that morning, which bore on this very point. Mr. Friel regretted that he would be unable to attend the meeting, but submitted a question: "whether it was possible to find a biometrical normal for occlusion." Later on in the note Mr. Friel said that there were far more postnormals than prenormals, so that the average would be on the postnormal side. From the profiles that had been thrown on the screen, however, there did not seem to be any suggestion of a postnormal. Mr. Chapman thanked Miss Tildesley again for her paper.

Miss Tildesley, in reply, agreed that she had stated that most characters in the body had been found to follow what was called the normal curve: a certain symmetrical curve which enabled the observer to make the predictions specified. There was, however, no reason for stating that all of the characters followed this curve until they were investigated. She had noticed in her reading that, from other people's observations, it appeared as if the distribution of the relative positions of the two first molars did not perhaps follow a normal curve. If the curve was asymmetrical it would still be possible to deal with it statistically. It was, however, necessary first to determine from adequate data (i.e., on a few hundred individuals of the same race, sex, and age group) exactly what was the form of the distribution. It might be a uni-modal asymmetric curve with a longer tail on the side representing "postnormal" occlusions than on that representing "prenormals." Or it might perhaps be a bi-modal curve reaching its highest point with "normally occluded" individuals, but

showing a second and lower mode representing "one-tooth postnormals," say: a form of curve which might be resolved statistically into two overlapping normal curves. Either form of curve could be dealt with, but the form of treatment depended on the form of curve. So also did the interpretation to be put on the data, and the standards for practical application that could be evolved therefrom. If the clinician would supply accurate and ample data, the statistician would be able to contribute the method of dealing with them, and of using the results. But the data should be given in not less than ten or twelve categories, and the categories should be equal. Measurements in millimeters would satisfy these conditions. The width of the relevant teeth might, however, also be recorded and it would then be possible to classify also as quarter-tooth, half-tooth, etc., prenormal or postnormal, as at present.

THE GREAT PROBLEM IN MALOCCLUSION OF THE TEETH OF THE TYPES OF CLASS II*

By Dr. Robert Dunn, San Francisco, Calif.

THE presenting of this subject for your consideration is for the purpose of soliciting your interest in the study of a dominant factor that in my experience transcends in importance all other factors involved in the development of malocclusion of the teeth. Because of the general lack of understanding and recognition of its presence, it is also one of the greatest factors in the reversions and failures of orthodontic efforts. I refer to the arrest of vertical development in molar and premolar region of the mandible with an occasional involvement of the same region in the maxilla.

It would be impossible, because of the extent of the subject, to go into all of its phases. I will, therefore, arbitrarily divide it into three types or classifications and other than a brief description of them, will confine myself largely to the consideration of the first type, which greatly exceeds the other two in number and in degree of arrest of vertical development.

In its involvement, there appears a protrusion or labial inclination of the maxillary incisors or a retruding of the maxillary incisors, an arrest of vertical development in mandibular molar and premolar region with a bilateral or unilateral distal position of the mandible; the body of the latter normal in form and size, but condyles apparently deflected from their normal relation in the temporomandibular joint. Teeth bilaterally or unilaterally in distoocclusion.

While the main concern in treating this type is the obtaining and maintaining that vertical arrangement in molar and premolar region that will be in harmony with the mandibular incisors and the temporomandibular joint, we are also concerned in the causative factor and how best to intercept it.

In the second type, in addition to the arrest of vertical development and distal relation of the mandible, the dental arch and teeth have apparently developed as a whole anteriorly to normal in their relation to the body of the mandible proper. This prevents establishing the facial contour to full harmony, while normal occlusion of the teeth may be obtained, the effect after treatment in the facial lines unless begun very early in life will be anything but pleasing, giving the appearance of an arrested growth of the mandible in the region of the chin, which in reality is not the case, the body of the mandible being normal, but distal to its proper relation to the upper part of the face. The deformity is amplified by strained muscular tissues.

Type three is of prenatal origin in which the body of the mandible is arrested in its anterior, posterior development as well as vertically, and attempts at correction unless begun extremely early in life, with periods of rest over an extended time, will result in but slight improvement, most always in

*Read at the Congress of the European Orthodontological Society, 1930.

failure. It is obvious that a different procedure in treatment is required in each of the above types.

We have, of necessity perhaps, become more or less fixed in the mechanics of orthodontia and have because of it, progressed but little in unfolding the mysteries of causative factors, with the result that great confusion exists as to cause and effect, and in no classification of the teeth is this more in evidence than in that great type of Class II, particularly of Division 1. For example, it is a common belief among orthodontists that malocclusions of Division 1 are the direct results of mouth-breathing, induced by pathologic conditions of the nose and throat. This is in the nature of a hypothesis, for in but comparatively few cases can this be substantiated and if orthodontists are to achieve greater success in their efforts, such suppositions must be greatly modified. It is a well-known fact that there is a preponderance of cases of habitual mouth-breathers wherein little or no malocclusion of the teeth exists and particularly not of the type of Class II.

In the many years of an exclusive practice of orthodontia, I have in that time, because of its manifestations, given the study of vertical development the preference, finding in the greater percentage of malocclusions of Class II, Division 1, the existence of an arrest, in varying degrees, of vertical development in molar and premolar regions of the mandible, with such mouth-breathing as existed, a result of the malocclusion of the teeth as evidenced in the many successful terminations of treated cases, in which pathologic conditions of the nose and throat, and mouth-breathing were wholly ignored.

Where mouth-breathing was found to be a dominating factor or only a contributing factor, a condition of excessive vertical development in molar and premolar region of maxillary arch existed, the degree depending upon the extent of the mouth-breathing and the mentality of the patient, in the latter case, with treatments extending over long periods of time and of doubtful termination.

The study of vertical growth and the successful termination of treated cases bear out previous statements that the mandibular incisors are invariably normal in their vertical arrangement, excepting in pathologic conditions as pyorrhea alveolaris and where extensive crowding prevents the full eruption of all of them, in which case one or more of the incisors will be found normal. They are apparently intended as a guide or fixed point by nature in the development of the dental space and condylar relation in the infant. In the permanent denture in conjunction with the first molar and condylar relation in the temporomandibular joint, they are basic points in the development of the dental apparatus to an harmonious state and the formation in the process of the curve of Spee so necessary in the guiding and maintaining of the mandible in its proper relation to the maxilla and cranium during its excursions and in occlusion.

If for any reason nature is deterred in her normal processes of vertical development, in molar and premolar region, the mandibular incisors then become active factors through the lingual incline planes of the maxillary incisors in forcing the mandible into an abnormal relation usually bilaterally or unilaterally distal to normal.

An otherwise apparently normally developing dental apparatus of today upon reaching a certain stage, may and does, migrate overnight, as it were, into a pronounced case of malocclusion. This sudden change has been observed time and time again in children and more frequently between the ages of six and eight years. The sudden return to normal will also occur during proper treatment of cases of this first type and with most gratifying results.

I am now completing the details of a most extreme case where such a change took place in the interim of visits of two weeks, during which time the vertical arrangement of the mandibular molars and premolars reached that stage wherein they came in harmony with the mandibular incisors and temporomandibular joint. This case, that of a boy fourteen years of age, had been treated for a number of years; all types and kinds of appliances had been tried, such as intermaxillary ligatures, bite-planes, cribs, splints, etc., and while the lad claimed to have given his full cooperation he was accused of lack of appreciation and actual opposition. This, of course, proved not to have been the case, for upon vigorous stimulation and movement of molars and premolars to a higher plane and in harmony with mandibular incisors and temporomandibular joint, the mandible, as stated above, suddenly changed its position from extreme distal to one of normal and at this writing, it is impossible for the patient to move it back to its former distal position.

One other supposition existing in the minds of many orthodontists, needing modification, is that pertaining to the relation of the teeth to the body of the mandible in unilateral disto-occlusion. This condition is nothing more or less than a mandible rotated bodily and should be so considered in the treatment of the case, any attempt at moving the teeth through the supposedly affected half of the mandible is wrong, and more often than not leads to extended treatments with questionable results. The proper course to pursue in such cases is to outline and carry on a treatment that will permit of the rotation of the mandible to its proper position. From all indications, rotated mandibles are due to erupting first molars or second deciduous molars (as the case may be), in a state of rotation, influenced by the arrest of vertical development, and the mandibular incisors occluding upon the lingual inclined planes of maxillary incisors.

Many cases of Class I have their inception in an arrest of vertical development. The failure of nature in producing the required vertical development in the deciduous molar region necessary to open the dental space sufficiently prevents the lateral development in mandibular canine and incisor region through the influence of the lingual inclined planes of the maxillary canines and incisors.

The following illustrations, all tried and proved cases, will convey to you the importance of establishing proper vertical arrangement of the teeth in mandibular molar and premolar regions.

A case of Class II, Division 1, is shown in Fig. 1. No operations in nasopharyngeal tract and patient was not a mouth-breather, although appearances might lead one to conclude that such was the case. Upon analysis of the case, it was concluded that there was an arrest of lateral development in both dental arches with maxillary incisors inclining labially and an arrest of

vertical growth in the molar and premolar regions of the mandible with mandible in a position distal to normal. Treatment was outlined to care for these deficiencies, stressing the arrest of vertical development which is the dominating factor. It might appear that all the teeth in the maxilla were anterior to their normal relation to other cranial structures, but such is not the case. The accuracy of the analysis is being depicted in the illustrations. Fig. 2 (left) was taken when patient was thirteen years of age and just prior to starting treatment. On the right, at fifteen years of age, and six months after completion of the case. In the profile portraits in Fig. 3 nothing is left to the imagination and further comment is unnecessary. The photographs in Fig. 4 were taken two years later, in which is noted the changes taking place due to growth and development into young womanhood.

In the case shown in Fig. 5, Class II, Division 1, that of a little girl ten years of age, the analysis disclosed that excepting the slight labial inclination of the maxillary incisors, the abnormality was in the mandible. First molars were in their proper positions in their individual jaws despite the fact of the premature loss of deciduous teeth. There had been some finger-sucking in this case prior to treatment which, in conjunction with the premature loss of deciduous teeth, resulted in an arrest of development of the mandibular dental arch anterior to first molars and in addition an arrest of vertical development in molar and premolar region of the mandible with a position distal to normal of the latter. Other than a slight adjustment of the maxillary incisors, the treatment was confined to the mandibular arch.

Normally, in each individual case there is a definite vertical arrangement in the mandibular molar and premolar region that correlates with the temporomandibular joint and the mandibular incisors, and this vertical arrangement determines the position of the mandible. Thus we see the great importance in obtaining and maintaining the correct vertical arrangement in each individual case in the treatment of malocclusion of the teeth. Proper vertical arrangement of the mandibular molar and premolar teeth and the maintaining of them in that vertical arrangement as an important factor in the development and preservation of the symmetrical contour of the human features are axiomatic.

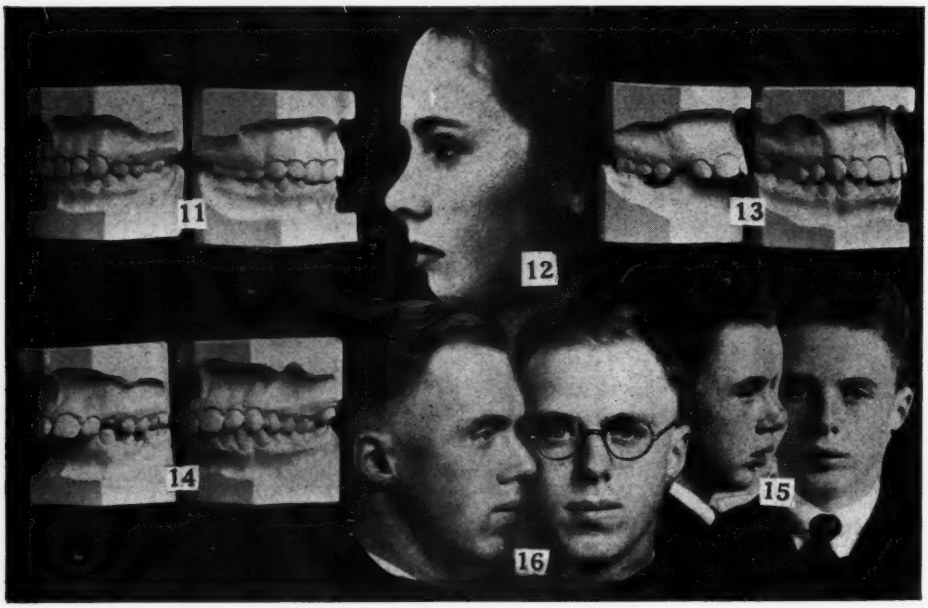
In making an analysis, we must be able to differentiate between normal and abnormal development, for in many cases between seven and twelve years of age there is an apparent labial inclination of maxillary incisors; this is, however, but a step in the natural development of that particular individual, the condition being accentuated or magnified by the lagging behind of development in the mandible.

Upon a proper analysis of the case, it will be noted that there is no apparent arrest in the vertical development, nor abnormal labial position of maxillary incisors. To verify this, we have but to keep the case under observation and note changes that take place, or turn to the family album and study the changes that take place in the facial lines as depicted in the pictures during growth and development of the child into adult life. Milo H. Hellman, of New York, has brought to our attention in his admirable work on growth and development the fact that the various parts of the head and face

1
2
3
4
5
6
7
8
9
10

do not develop synchronously, but that one part may develop faster than another. We should be well informed as to recent findings as to growth and development for a lack of such understanding may mean a wrong analysis with misapplication of appliances resulting in an otherwise normally developed case being later converted into a case of malocclusion through mechanical interference.

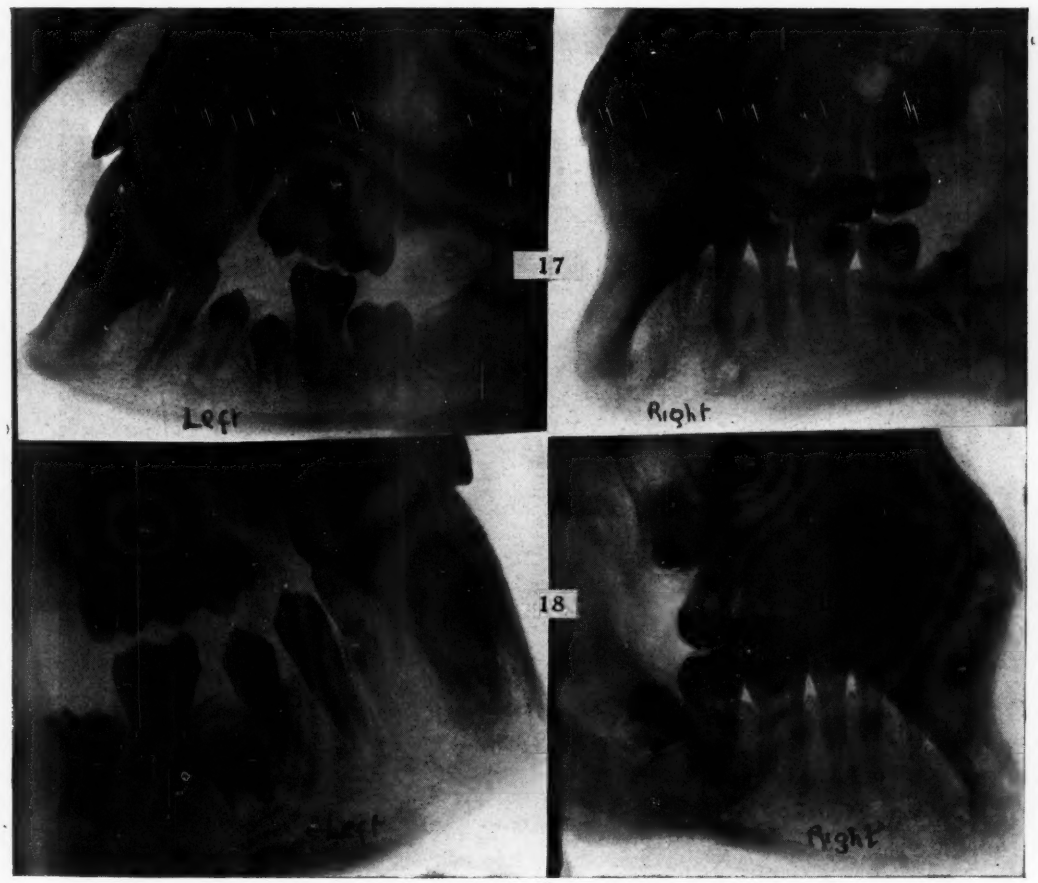
Fig. 6, with others to follow, clearly and distinctly demonstrates the fact that the mandible through arrest of vertical development in molar or premolar region is a great factor in the producing of malocclusion of the teeth, particularly in cases of the extensive type of Class II. Fig. 7 shows that there was no interference with growth and development from appliances in this case.



In the case shown in Fig. 8, a little girl, eight years old; like the former, we find the offending mandible with its arrested development in dental arch, both anterior and posterior and vertically in the extreme. The analysis in this case developed the fact that the mandibular deciduous molars and canines were lost extremely early.

Adenoids and tonsillar tissues were removed although this child was not, nor had she been, a mouth-breather, and therefore should not be catalogued as such. How could she when you see the almost constant position of the lower lip against the maxillary incisors. The treatment was directed almost entirely to the mandible and I believe that if nothing at all had been done to the maxillary arch, such abnormality as existed there would have been remedied through growth and development and normal muscular functioning (Fig. 9). The occlusal view in Fig. 10 gives a better conception of the arrest of development in the mandible. The models (Fig. 11) were obtained at eleven and one-half years of age and one half year after all retention had been removed, and this portrait (Fig. 12) six months later.

These models shown in Fig. 13 are of a boy at twelve and fifteen years of age before and after treatment, and while similar to the two preceding cases, differ in that the arrest of development in the mandible involved the entire mandible anterior to first molar, with impacted premolar and extreme arrest of vertical development in molar and premolar region. First molar relations were normal. There were no habits and the patient was not a mouth-breather. The occluding of the mandibular incisors upon the incline plane of maxillary incisors forced the latter into a labial inclination (Fig. 14). In the portraits shown in Fig. 15, how clearly portrayed is the arrest of development both



horizontally and vertically in the mandible. In Fig. 16 we see the young man at eighteen years of age, two and a half years after retention had been discontinued. The radiograms in Fig. 17 clearly show the vertical development obtained in the lateral halves of the mandible. The one on the left taken before treatment was started and that on the right after removal of the appliances. Fig. 18 illustrates the opposite side of the same case.

I am showing the case in Fig. 19 because of the attempt of some orthodontists to justify extraction in such conditions. In all my years of practice, I have extracted in only three instances and have lived to regret each one.

The dominating factor in the case of Class I shown in Fig. 20 is arrest of vertical development in molar and premolar region of mandible. In Fig. 21

the models on the left were obtained in 1915 and those on the right in 1920. Treatment was completed three years after. The study model of the same patient (Fig. 22) was obtained and forwarded to me in 1928, eight years later, by Dr. John Taylor, of Hollywood, California, and speaks for itself.

In Fig. 23, an interesting feature in this case was the condition of pyorrhea existing on presentation for treatment and which is clearly shown in the incisor region in the model on the right. On the left is shown how it had cleared up without treatment after the traumatism had been removed and as it appeared at the time the model was obtained, five years later and with no recurrence.

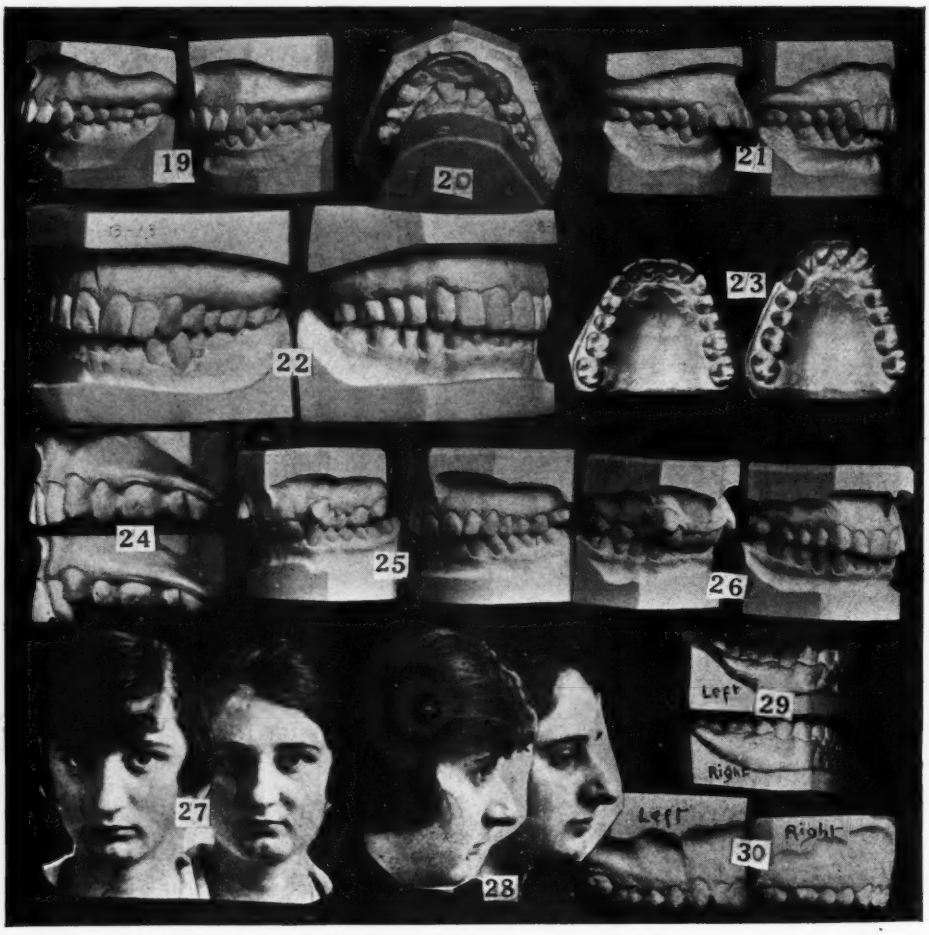


Fig. 24 portrays the amount of vertical development in molar and premolar region so necessary for permanency of treatment and without extraction.

Fig. 25 should prove of interest because it is an unusual one and would be placed by H. A. Pullen, of Buffalo, N. Y., as Class IV. Angle classification more clearly shown in Fig. 26.

Upon examination of the models on the right in Fig. 26, it would appear as though the teeth in the maxillary arch had moved mesially in their entirety and extraction indicated, but upon an analysis of the portraits, Fig. 27, it

will be seen that the lack of harmony in the facial lines is largely confined to the mandibular region with extraction contraindicated. How clearly this is shown in the profile portraits in Fig. 28, and as nature is still undergoing the process of growth and development, greater improvement will take place in the facial lines and the full complement of teeth retained.

It is very important to remember that the mandibular incisors, when forced by mechanical appliances to positions of infraocclusion (not tipped), and as illustrated in the models on the right in Fig. 29, will invariably return after being released to their typical vertical arrangement, and if sufficient vertical development in molar and premolar region has not been obtained and any molar rotation corrected regardless of appliances, the efforts of the orthodontist will not be a success. The models on the left illustrate the arrangement one should strive to obtain.

How often we see published, even in our textbooks, illustrations of treated cases of Class II, Division 1, appearing as shown in the models in Fig. 30 and the one just shown. Apparently no attempt was made to establish the occlusal planes of the teeth to conform to the curve of Spee so necessary for stability and as shown in this cast on the left and that on left of picture previously shown. Failure invariably follows cases treated in such a manner.

Fig. 31. The following case is presented for two reasons: first, because I believe it to be the only one of the type in degree of deformity on record that has ever been corrected and in which the result was almost ideal; second, because there must have occurred through the treatment an establishment of harmony between the temporomandibular joint, vertical arrangement of mandibular molar and premolars and mandibular incisors. Otherwise, the corrected deformity and malposition of the mandible would not have remained permanent.

One would not have to draw very far upon his imagination to depict the face that goes with such jaws as these models represent. (Fig. 31.) Here is where acute perception, accurate observation, art and skill, go hand in hand with good common sense into the making of an intelligent analysis. Not only had we to correct the malformation of the jaws, but had to overcome a psychologic state of mind brought on by the deformity.

In the analysis, we found that both dental arches had been mutilated by extraction. All maxillary incisors were pulpless with areas of pathology at root apices evidenced by fistula. There was an arrest of development in the premaxillary region of the maxilla with an impaction in lingual position of left second premolar and an excessive development posterior-anterior in the lateral halves of the mandible with the latter in an extreme mesial position. The maxillary incisors were treated as well as could be done and retained for purposes of development.

The correctness of our analysis will be seen in the models of Fig. 32. You will note that the maxillary arch has been developed mesially and the entire mandible moved distally with the lateral halves shortened, which I wish particularly to call to your attention. You will also note in the models that pin and tube appliances were used, designated at that time as working retainers.

The portraits, taken at twenty-two years of age and before treatment, depict the effect of the deformity of the jaws in the face (Fig. 33). It is not much wonder that she had a distorted view of life, seeing nothing worth while in the future.

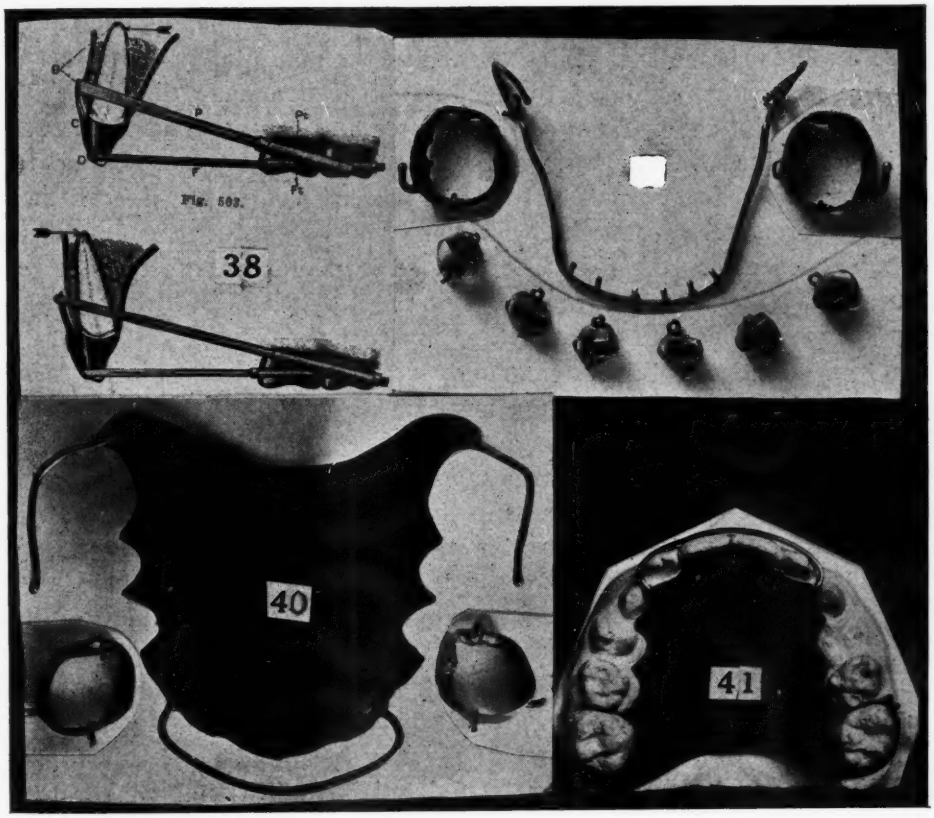
In Fig. 34 we see quite a change, and she begins to feel that things are not so bad after all. These portraits were taken at the time the working

retainers were placed, and the following ones (Fig. 35) were taken one year later and at the time the models just previously shown were obtained. How graphically the expression of the face discloses her changed attitude toward life. This patient was lost sight of soon after this portrait was obtained, and I did not see her again until fifteen years later. In the meantime, much and very poor dentistry had been done, but in spite of all that, it will be seen

(Fig. 36) that the dental arches and jaws remained as they were placed. Fig. 37 shows her as she is today. I will state here that the ribbon-arch and bracket-band appliance was used in the maxillary dental arch with the Calvin Case bodily-movement appliance as here shown (Fig. 38), in the mandibular dental arch.

It was not intended to go into details of appliances and treatment of these cases, for that would require a very lengthy discourse. A brief description, however, may be of some value.

In the cases of Class II, Division 1, the ribbon-arch and bracket-band appliance was used in the mandibular dental arch, the ribbon-arch being aligned



as high up as the maxillary teeth in the lateral halves would permit, when in occlusion. This alignment was changed from time to time as vertical development was obtained, a slight bend downward anterior to the nut of ribbon-arch being made to assist in elevating the first molars; fine ligature wires were then securely fastened about the necks of the premolars and extended to the ribbon-arch and tightened from time to time, the force expended depending upon the judgment of the operator.

In the maxillary dental arch, a plain expansion arch was used aligning the same a little below the middle third of the first molar and central incisors, engaging slots formed in extended seams of bands cemented to maxillary incisors, the purpose of which is to prevent elongation of incisors in their distal movement and tipping of first molars mesially. A slight bend upward

of the expansion arch just anterior to first premolar aids in the movement of incisors to their proper positions. Care should be exercised that maxillary incisors are not carried too far distally, for, in such case, desired results will not be obtained.

When in the judgment of the operator, these teeth have been tipped sufficiently distally, small lugs should be soldered to the expansion arch to engage buccal tubes, thus preventing further distal movement.

The use of wire ligatures in the maxillary dental arch will depend upon the judgment of the operator. Provisions are made for the use of intermaxillary rubber ligatures which will be found necessary during part of the treatment in some of the cases.

The sustaining appliances used are depicted in Figs. 39, 40, 41.

In Fig. 39 is shown that which is used in the mandibular dental arch, the short wire extensions soldered to the lingual arch engage the little eyelets soldered to the lingual surfaces of the incisors and canine bands. In extreme cases, it is best for several months after the placement of this appliance to use fine ligature wires from about the necks of premolars to the lingual arch or bands upon premolars from which are soldered ½ staples to engage the lingual arch; thereafter they may be removed permanently, the balance of the appliance other than removal for prophylaxis, should be retained for approximately six months or longer to further insure permanency.

In Fig. 40 this appliance, commonly called a bite-plane, is used in the maxillary arch and placed at the same time as that of the mandibular arch and is depended upon to care for any depressing of the mandibular incisors that may have occurred during treatment. It is to be worn for at least another six months or for such time as in the judgment of the operator is necessary; thereafter, it may be worn at nights only. The gold platinum spring wire used is 0.038 gauge. I cannot say too much for this appliance (the feature of the molar attachment being suggested by Carl Engstrom, of Sacramento, California), for much can be accomplished through its use in intercepting malocclusion of Classes I and II. You will note that there is an inclined plane constructed in its anterior portion for the engagement of the mandibular incisors during treatment. It may be found necessary to change this inclined plane, which is done by vulcanizing additional rubber thereto. So effective is this simple appliance that when intelligently handled it will be found sufficient in itself in the intercepting of a large number of developing malocclusions of Class I and Class II.

It is very efficacious in broadening the maxillary dental arch through pressure exerted from the occlusion of mandibular incisors and adjustment of the wire clasps that engage the half staples on molar bands, and because of such, must be kept well under control, otherwise an overexpanded arch will result. The beginning of such is shown in Fig. 41. When this appears to be taking place, wire extensions engaging buccal surfaces of premolars or deciduous molars may be soldered to labial wire which will arrest overexpansion.

In the cases of Class I and Division 2, Class II ribbon-arch appliances were used in both maxillary and mandibular dental arches.

The profession of orthodontia is now facing a critical situation. The public is getting tired of long-drawn-out treatments. No longer should we depend upon the magic of appliances nor become confused by the theories of those who are themselves confused by their lack of conception of orthodontics and must of necessity conjure up fads to bolster up their imaginations. We must more than ever bend our efforts toward intercepting malocclusions of the teeth. Build for the future as well as for today, and in the course of our constructions, establish the foundations so that in the final completion of the structure there must result complete harmony in the dental apparatus during the excursions of the mandible in masticating, occlusion and at rest.

CONCLUSION

The lack of sufficient vertical development in molar and premolar region being largely confined to the mandible does, because of the mobility of the latter, become the greatest known factor in producing malocclusion of the teeth. It, therefore, in the belief of the writer, presents for our solution as the outstanding problem today, the following: Why do we have this arrest of vertical development and why is it entirely or largely so confined to the mandible? What changes actually take place in the temporomandibular joint? Are the bursa and meniscus the media whereby the condyles are accommodated in their deviated positions? What will be the means of determining the amount of the vertical arrangement in molar and premolar region necessary to be in harmony with mandibular incisors and the temporomandibular joint? What will be the most practical procedure in its inception?

While the solution of these problems is now in sight, in part at least, your aid is most earnestly solicited in its hastening.

REFERENCES

Dunn, Robert: Vertical Development in Mandible. Pacific Coast Society of Orthodontia, San Francisco, California, February, 1912.

Pullen, H. A.: The Abnormally Deep Over-Bite. Its Significance and Treatment, Items **38:** 416, 1916.

Pullen, H. A.: Treatment of Deep Under-Bite. First Trans. Internat. Ortho. Cong., p. 614, 1926.

Dunn, Robert: Vertical Over-Bite or Arrested Vertical Development in Molar and Premolar Region, INTERNAT. J. ORTHOD. RADIOG. & ORAL SURG. **12:** 685, 1926.

Hellman, Milo H.: The Orbital Plane. Its Relation to Dentition in the Course of Development and to Dentition in Malocclusions, INTERNAT. J. ORTHOD. RADIOG. & ORAL SURG. **16:** 151, 1930.

Rogers, Alfred P.: A Consideration of Infra-Occlusion, Eighth Annual Meeting, American Society of Orthodontists, Washington, D. C., November, 1908.

ONE USE FOR THE ARNOLD COILED SPRING*

By George M. Anderson, D.D.S., Baltimore, Md.

I HAVE always had considerable difficulty in satisfactorily treating children who live any distance from Baltimore, when I had to use a labial arch with threaded ends and nuts for the labial movement of the incisor teeth. To turn the nut hard against the buccal tube would result in discomfort, and an insufficient amount would delay the completion of the case or result in more frequent visits. Several years ago I visited a clinic by Dr. E. B. Arnold in

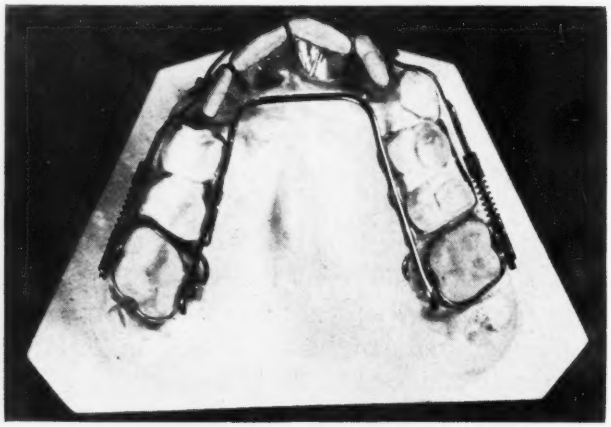


Fig. 1.

which he showed various uses for his coiled spring in connection with the lingual arch. Since that time I have not inserted a single labial arch when I wanted labial movement of the incisor teeth without using a short piece of the coiled spring between the nut and the tube. I found that if I left the end of the arch which entered the tube smooth (no threads) that I obtained even better results. To do this, of course, necessitates making a sectional arch so that but one-half of each end of the labial arch is threaded, but the comfortable results more than justify the little bit of extra work. Fewer adjustments have to be made later but the movement is continuous.

*Read at a meeting of the Southern Society of Orthodontists, Miami, Fla., Jan. 13, 14, 15, 1931.

DEEP OVERBITE

(Case Report)

By Harle L. Parks, D.D.S., Atlanta, Ga.

HISTORY.—The patient appeared for treatment June 6, 1925, with the following history: Patient, male, aged eight years, voice not clear, good vision and hearing, weighed fifty-five pounds, oral health good. Tonsils were infected, general health fair with slight anemic appearance, face appeared narrow. Father's teeth are normal, mother's teeth abnormal, neither of parents had had orthodontic treatment. Facial form of father is good, but the mother has an undeveloped chin.

Fig. 1.

Child had the following illnesses at the age of three or four years: Colitis and acidosis, had recurrent attacks of colds and bronchitis. Had pneumonia at age of six years. No operation on nose or throat, frequent attacks of rash. Patient was breast-fed and did not suck thumb or use pacifiers. Began walking at nineteen months. No record of when deciduous teeth appeared. Permanent teeth appeared at age of seven years.

Attributed Etiology.—I have been unable to establish any definite etiologic factors that have had direct bearing upon malocclusion in this case.

Diagnosis.—This case was diagnosed as being a neutral occlusion case with

infraversion of both mandibular and maxillary molars and supraversion of both mandibular and maxillary anterior teeth, with slight restriction of both arches.

Treatment.—This case was started by another orthodontist on June 1, 1925, with lingual appliances with auxiliary springs for expansion. The case was treated by this orthodontist until August 14, 1925, at which time the orthodontist referred it to me for completion. I regret that we were unable to get the original photographs of this case.

Fig. 1 shows x-ray photographs of case when started.

Fig. 2 shows models (174) of case when started on June 1, 1925; also (173) of case on August 24, 1925. At this time the lingual appliances were

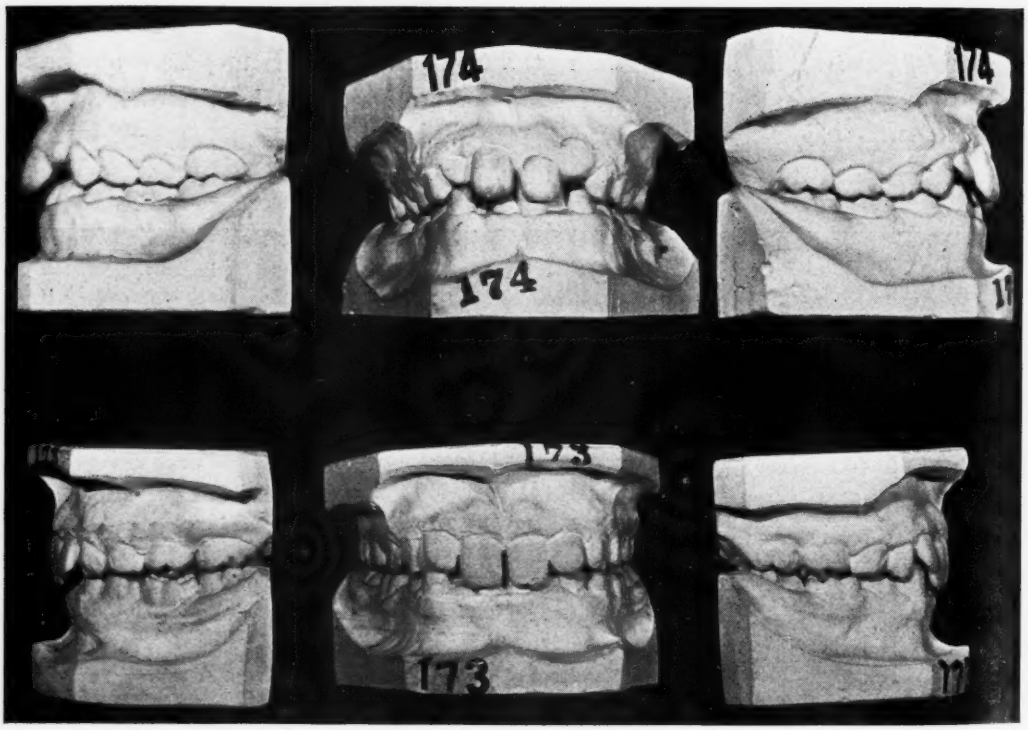


Fig. 2.

reconstructed on the maxillary arch, placing a slight forward pressure on the maxillary incisors. The expansion was continued on the mandibular teeth for a period of six months.

At this time a labial appliance was placed on the mandibular teeth with perpendicular spurs touching approximately the incisal edge of the laterals and the laterals were ligated to the body wire in order to produce a forward apical movement of the teeth. At this time a bite plane was placed upon the maxillary arch for the purpose of depressing both the maxillary and the mandibular incisors. Also allowing a vertical development of the molars and premolars. By this type of treatment we hoped to produce an equalization of the infraversion and supraversion of all the teeth. What happened, we do not know, except that a change took place, reducing the so-called over-

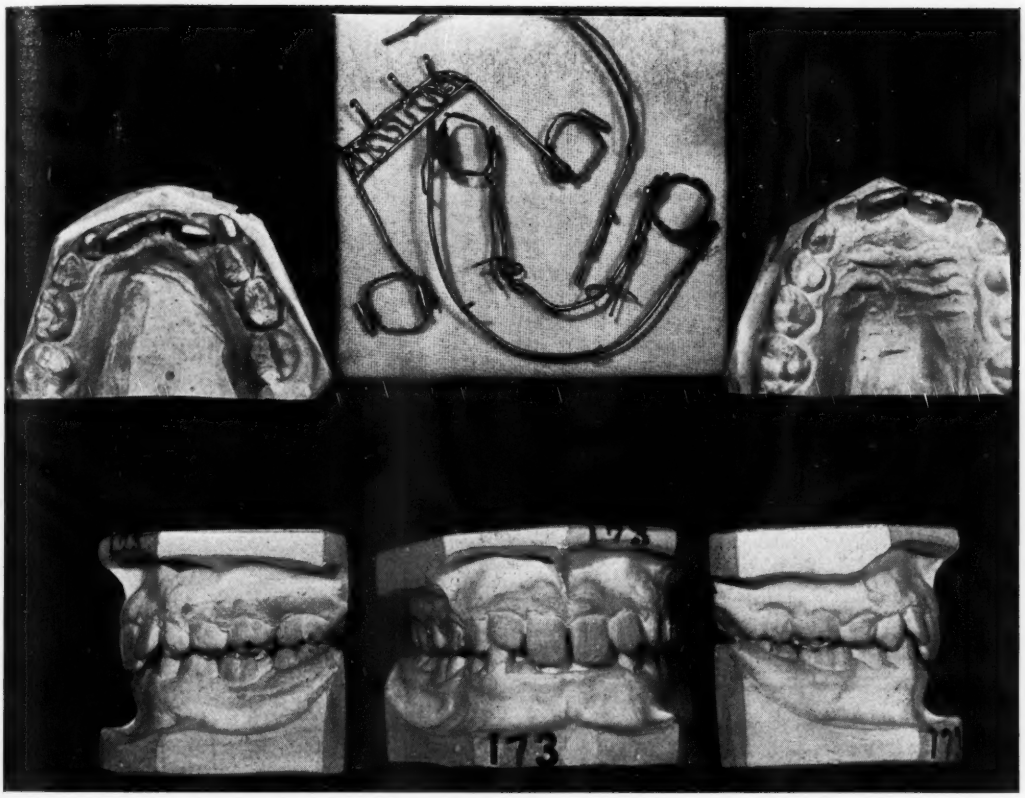


Fig. 3.

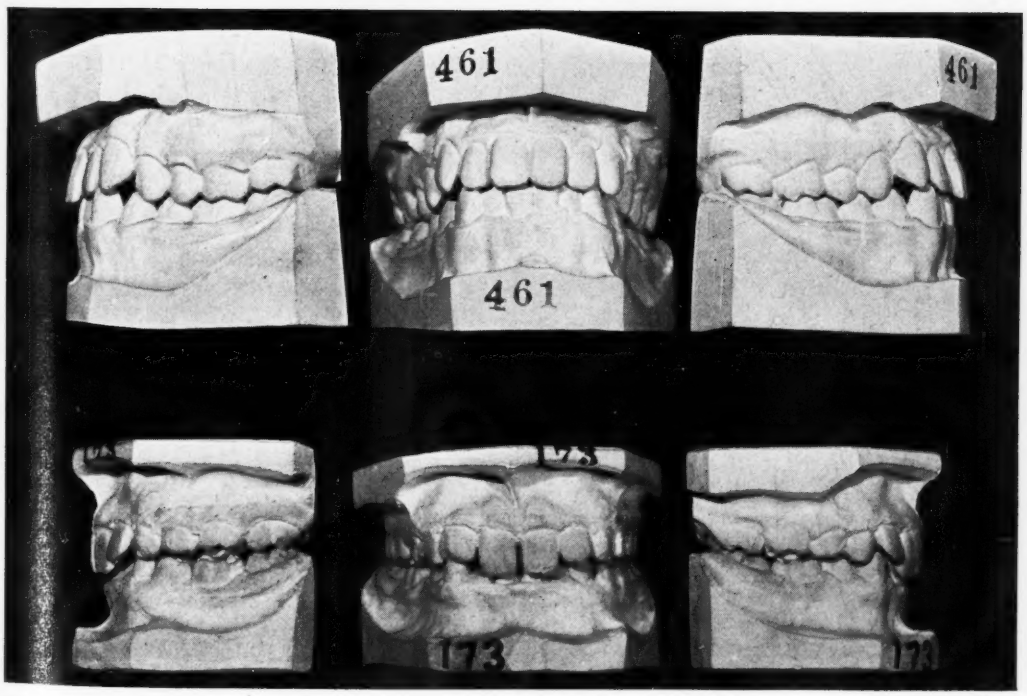


Fig. 4.

bite to what is probably normal for this case. The bite plane was worn for ten or twelve months. The case was allowed to rest for six months. At this time we placed an outside labial appliance with a piece of 0.020 wire attached to the labial appliance in the canine region extending downward approximately to the incisal edge, then extending forward and back to the canine region on the other side and attached to the body wire as above described. The 0.020 wire was adjusted to touch the four incisors about the occlusal third of the crowns, and the main body wire was adjusted to stand away from the gingival margin.

Then the maxillary anterior teeth were ligated to the main body wire, thereby producing anterior apical movement of the anterior teeth, with loops of 0.020 wire attached to the body wire in front of the tubes on the molar

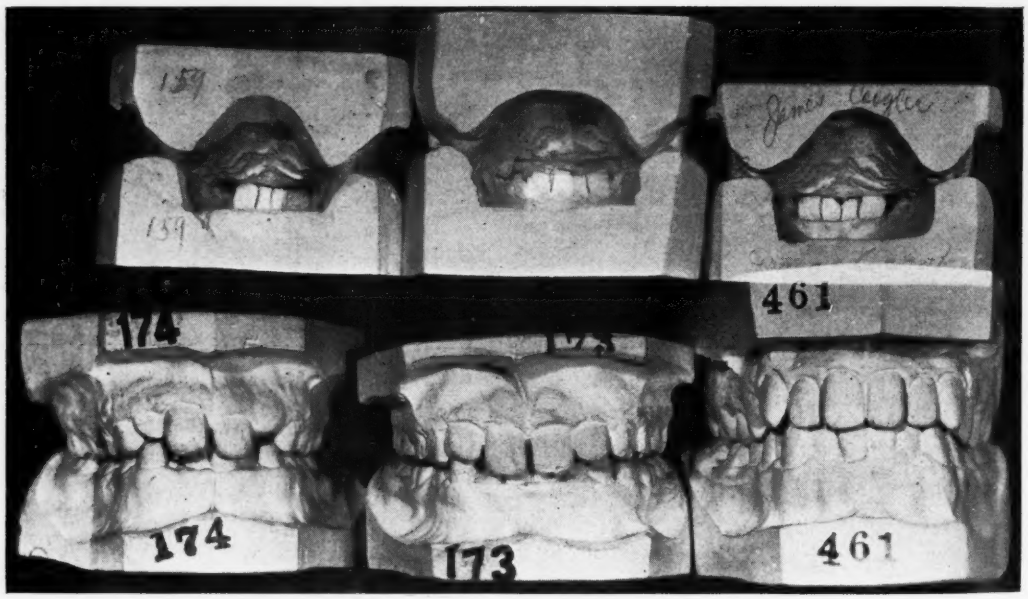


Fig. 5.

bands. These loops were used for making mesial adjustments of the appliances as case demanded, also for tying the appliances to the anchor bands.

Fig. 3 shows all appliances used in this case, also shows four views of the case when I began the treatment.

Fig. 4 (top row 461) shows models of case when dismissed on August 8, 1930, and (bottom row 173) shows models of case when referred to me for finishing.

Fig. 5 shows views from back giving relation of the mandibular incisors to the maxillary incisors from the lingual aspect. Top row left, when case was first started. Center, when case was finished, and right, when I received the case. Bottom left (174), when case was started; center (173), when I received the case, and right (461) when I finished the case.

Fig. 6 shows x-ray pictures of the case when the patient was dismissed.

Fig. 7 shows front view of patient when dismissed on August 8, 1930. The heavy roll of the lower lip has disappeared.

Fig. 8 shows profile view of the patient when dismissed.

Fig. 9 shows front view of the teeth in occlusion. Apparently the deep overbite has disappeared.

Results Achieved.—With the described treatment we were able to correct the deep overbite and make the necessary lateral and vertical development.

Fig. 6.

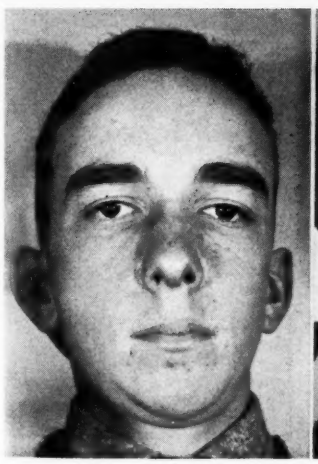


Fig. 7.

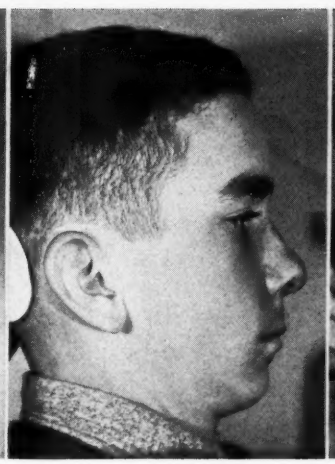


Fig. 8.

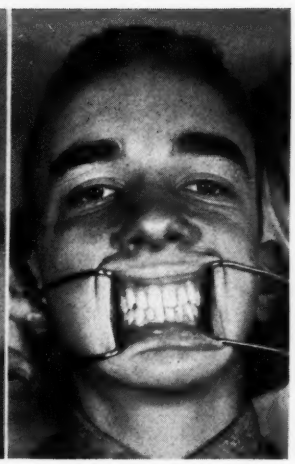


Fig. 9.

Fortunately, as far as x-ray examination reveals there was no root resorption of the anterior teeth from the use of the bite plane. The treatment has produced fairly satisfactory results from an esthetic standpoint. The deep roll from the lower lip has disappeared. The vertical development increased.

Prognosis.—In my opinion the correction of the deep overbite in this

case will remain permanent. The equalization of the infraversion and supraversion has been corrected for two years. However, the appliances have been on for finishing alignment intermittently for approximately two years.

Observation.—The case has been observed since August 8, 1930. The only sign of relapse is a very small amount of contraction of the arches. The patient and the parents are well satisfied and refuse to return for any adjustment of the case.

NOTE.—A simple method for making the slides of models as shown: Use a soft, black background with two shelves. Place models showing front view of the beginning and completion of case in center of the shelves. Mark point on either side of the cast. Expose. Place both casts for left view and expose again. Place both casts for right view and expose. Develop and print. Slides are then made by reducing the composite picture to a lantern-size slide.

THE TREATMENT OF A CASE OF MALOCCLUSION DURING PREGNANCY*

By R. P. Howarth, D.D.S., Cleveland, Ohio

THIS case is of interest due to the fact, as the title states, that it was carried on during pregnancy.

History.—Mrs. W., aged thirty-one years, presented herself to me for orthodontic care on January 16, 1930, after she had obtained the consent of her obstetrician, Dr. Floyd Mowry of Cleveland. She informed me that she had been pregnant for about two months. I was not immediately interested in the case because we have been told how pregnancy often places a tremendous drain on the calcium salts involving all the tissues of the body thereby promoting rapid tooth decay and interfering with normal bone metabolism. If

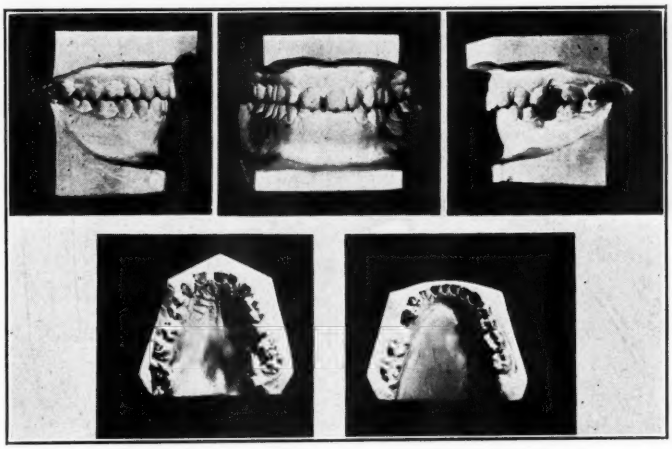


Fig. 1.

there should happen to be a dearth of calcium salts, there would probably be an insufficient deposition of calcium in the new bone tissue. I then explained to her these possibilities of rapid, extensive caries and the lowering of gum tissue tone. I also pointed out that the appliances which I would use were not conducive to beauty. To this last objection she replied that she did not care about that as she might just as well be homely all over and that she would gladly assume all responsibility.

So treatment was undertaken with the understanding that I could remove the appliances at any time that I felt their continued use would be injurious.

Fig. 1 shows casts of case taken before treatment, January 16, 1930.

Attributed Etiology.—Due to the loss of the maxillary and mandibular left molars some time ago a closing of the bite had been taking place. This

*Read at the Thirtieth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., April 20-24, 1931.

process had been forcing the maxillary incisors labially and spreading them apart. There was also an abnormal labium frenum. The maxillary right lateral incisor is congenitally missing, resulting in a mesial drift of all the maxillary teeth on that side. Facial lines were harmonious with the exception of a slight protrusion of the lips.

Diagnosis.—The case was diagnosed as a mutilated neutroclusion with a mesial interdigitation of the teeth of the right half of the maxilla, compensated for by the congenital absence of the maxillary right lateral incisor.

Treatment Therapy Employed.—Under the plan of treatment the first thing to do was to remove the abnormal frenum labium. The second step was to open the bite to which the reciprocal reaction was a distal and occlusal movement of the anchor teeth. The labial root movement of the maxillary incisors together with the closing of their interproximal spaces was the final step.

The appliance for the maxillary arch was composed of fitted molar bands on the right first molar and the left second molar to which were soldered

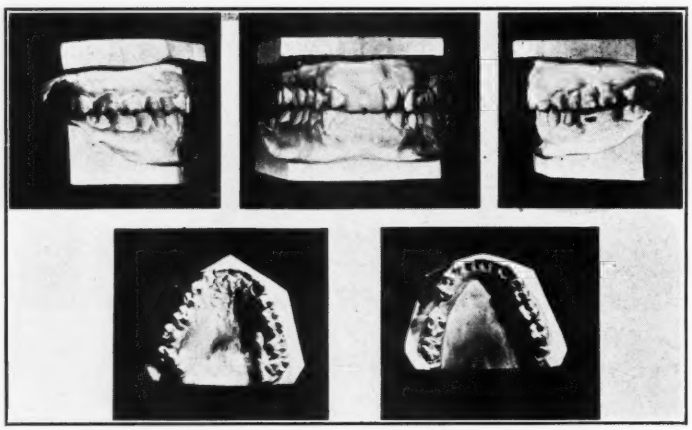


Fig. 2.

curvilinear sheaths. Angle bracket bands were cemented on the maxillary anterior teeth from canine to canine. Hooks were soldered to the ribbon arch just distal to the canines.

The mandibular appliance consisted of fitted molar bands to which were soldered curvilinear sheaths. A partial 18 gauge lingual arch was soldered to bracket bands on the two canines. This increased their stability, as the lingual wire also rested on the lingual incline planes of the four incisors.

The only uses to which the mandibular appliances was put were a distal tipping of the mandibular left second molar and as anchorage for the intermaxillary rubbers. No attempt was made to correct the slight malalignment in the mandibular left canine region because of the difficulty of its permanent retention.

A constant check was kept on the condition of the gums and teeth. Great care was taken in the adjustment of the appliances so that no discomfort would be produced.

On July 7, 1930, or not quite seven months after instituting treatment, a Hawley retainer was placed on the maxillary teeth. An appointment was

made to place the mandibular space retainer on July 19. Due to the birth of the baby on this day I was not able to place it until August 19.

Fig. 2 shows casts taken on March 3, 1931, eight and one-half months after retainers were placed. Casts in upper right hand corner not related correctly by photographs. There is a much better cuspal relationship.

Results Achieved.—By this time the bite had been opened, the maxillary anterior teeth were tipped lingually and the spaces between these teeth had been closed. The occlusion of the maxillary and mandibular left second molars had been improved.

A fixed sanitary bridge has since been inserted in the maxillary molar space.

Fig. 3.

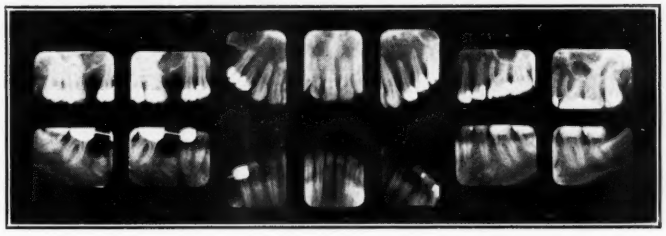


Fig. 4.

Fig. 3 shows photographs taken March 10, 1931.

Prognosis.—To maintain the present results the maxillary Hawley retainer will have to be worn at nights until the bite has become stabilized and the muscles of the mouth have attained sufficient tone through exercises to maintain the maxillary incisors in their present positions. Bridge work must replace the mandibular space retainer which will help to maintain the present bite.

Fig. 4 shows x-rays taken November 11, 1930.

OBSERVATIONS AND CONCLUSIONS

Dr. M. Llewellynn Drake, her dentist, reports as follows: "Examination of Mrs. W's teeth and gingivae (following her orthodontic treatment during pregnancy) reveals no inflammatory conditions of the gum tissue, and only a slight mobility of some of the teeth which is rapidly disappearing. I really

expected to see much more mobility, considering the time and distances some teeth were moved. No cavities developed.

"When the space between the upper right lateral and cuspid was closed, it caused a slight hypertrophy of the interproximal gingiva which was reduced by two applications of trichloracetic acid."

The x-rays show no interproximal alveolar bone or tooth root resorptions.

The case progressed as rapidly as in any child under the most favorable conditions of growth. The only discomfort the patient experienced was in accommodating herself to the Hawley retainer.

I realized at the start that we were gambling with many unknown factors, yet I felt that those same factors which might be detrimental could also be helpful to a successful completion of the case. It was possible as the result of the pregnancy that there might be a very rapid generation of new tissues.

Because the pregnancy was normal in every respect and she was not afflicted with morning sickness and also because I could not discourage her I thought the case was worth the attempt. I know that if the same set of factors should present themselves again my reaction would be the same.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of
Sterling V. Mead, D.D.S., Washington, D.C., Director
M. N. Federspiel, D.D.S., M.D., F.A.C.S., Milwaukee.—Vilray P. Blair, M.D., F.A.C.S., St. Louis, Mo.—Theodor Blum, D.D.S., M.D., F.A.C.D., New York.—Leroy M. S. Miner, M.D., D.M.D., Boston.—Wm. L. Shearer, M.D., D.D.S., Omaha.—Frederick F. Molt, D.D.S., Chicago.—Robert H. Ivy, M.D., D.D.S., Philadelphia.—Edward L. Miloslavich, M.D., Milwaukee.—French K. Hansel, M.D., M.S., St. Louis, Mo.—W. M. Reppeto, D.D.S., Dallas, Texas.—Leo Winter, D.D.S., New York.

METHODS OF TREATING DENTULOUS AND EDENTULOUS MANDIBULAR FRACTURES

By John L. Preston, D.D.S., Wichita Falls, Texas

THE fundamental principles involved in the treatment of fractures in general are for the most part applicable to the treatment of fractures of the mandible, and consist mainly in reducing the fracture and maintaining immobilization of the fragments in correct relation during the process of callus formation and osseous union.

Both operative procedure and an accurate diagnosis should of course follow a study of all radiographic evidence before attempting to adjust any kind of an appliance in the mouth for fixation. To accomplish the best results it is advisable to select a type of splint that is uncomplicated in construction and application and having a wide range of adaptability. It should also permit speedy access in opening the mouth in case of an emergency caused by postoperative hemorrhage or nausea following a general anesthetic.

All cases of mandibular fractures may be conveniently divided into two general classes, i.e., dentulous and edentulous, and each class requires a different method of treatment.

The use of ligature wires in conjunction with pieces of heavier wire fastened to the teeth for splints, has formed the basis of an approved method for treating mandibular fractures of the dentulous class. This method employs one maxillary arch bar and two mandibular arch bars (the lower being connected in the molar region with small bridge wires), which are made of sixteen gauge gold-plated wire, properly shaped and graduated in four sizes to accommodate the average mouth.

Fig. 1 illustrates this type of interdental splint which is designed for treating various kinds of fractures of the mandible where some teeth are present in the mouth for attachment. The simplicity and easy application of

these splints offer many decided advantages, more especially as restoration of former occlusal relation of the teeth can be established by using this type of splint, a fact which is of very great importance. Another advantage is the reasonable comfort afforded the patient undergoing treatment since irritation to the mucous membrane as a result of contact with the splint is thereby reduced to a minimum.

The fact that no impressions of the mouth are necessary renders this type of splint ready for immediate use, with the possible exception that where considerable displacement of fragments occur because of muscular contraction it may be necessary to reduce the fracture to some extent before applying the splint. This can be done by manipulation and looping wire ligatures around at least two teeth adjacent to the fracture and by twisting the free ends tightly, thus bringing the fragments in close apposition and alignment. After this procedure the next thing in order is the selection of a proper-sized splint suitable for the case.

Technic of Application.—In proceeding to adjust the mandibular splint, hold it firmly with the fingers of both hands and push it down over the teeth

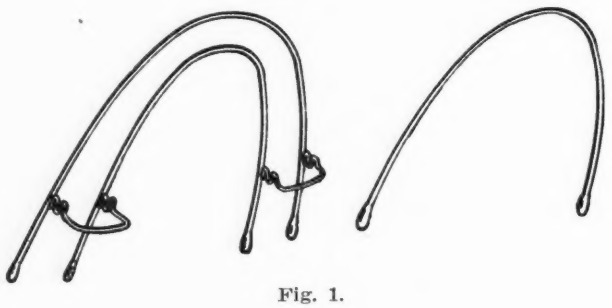


Fig. 1.

to an approximate position in the mouth. Then insert two Ivory rubber-dam clamps, one on each side of the jaw, to a premolar or molar tooth for the purpose of holding the splint securely while ligating it to the teeth. With a pair of curved hemostat forceps grasp the end of a wire ligature directing it at an angle of 45 degrees through the interproximal space between the teeth and underneath the lingual arch bar. Then pick up the end again, directing it back over the lingual bar through the next interproximal space buccally and underneath the buccal arch bar, thus forming a loop which engages the tooth and both splint bars at the same time. Twist the ligature wire as tightly as possible, and, after cutting off the excess, bend the ends back between the teeth to prevent irritation of the mucous membrane.

Note wire application in Fig. 2.

After a few teeth have been ligated, remove the clamps, and repeat the process of ligation to as many teeth on both sides of the jaw as may be necessary to insure complete fixation, but without including the teeth in direct line of the fracture.

The maxillary bar should likewise be securely fastened to the maxillary teeth and used for attachment by double strand wire loops to the mandibular bar on either side for the purpose of reestablishing anatomic occlusion of the teeth as well as stabilizing the jaws in early treatment. If the small bridge

wires connecting the buccal and lingual arch bars interfere with occlusion when the jaws are closed, remove them entirely.

Fig. 3 shows final adjustment of the splint with wire loops in place.

Oral asepsis is of prime importance in postoperative treatment of compound fractures of the mandible and may be accomplished by daily use of the toothbrush and by frequent irrigations with an antiseptic mouth wash. To open the mouth for this purpose, replace a broken ligature wire, or, even in case of an emergency, simply cut the wire loops connecting the maxillary and mandibular bars with a pair of scissors. This can be done without disturbing

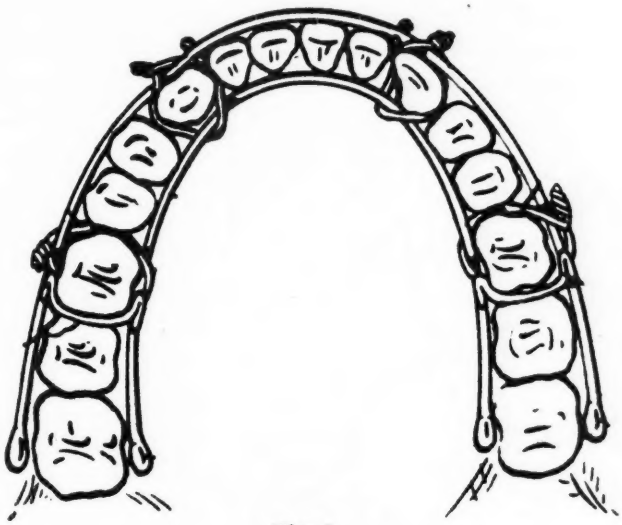


Fig. 2.

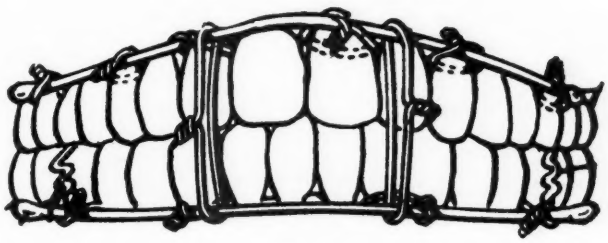


Fig. 3.

the retention of the splint, and later, when desired, reclosure of the mouth can be established by relooping the maxillary and mandibular bars together again.

Satisfactory immobilization of the jaws is obtained by proper adjustment of the wire interdental splints, and therefore does not require the need for outside jaw braces or bandages for additional support. Liquid foods should usually be administered to the patient every two or three hours through a glass tube, and should contain a reasonable amount of calcium salts to facilitate bone repair.

Edentulous fractures present a different situation from the above described technic for treating dentulous fractures, as in the latter case no teeth are present in the mouth for attachment.

The type of splint used in treating edentulous fracture cases must therefore conform to the natural anatomic outlines of both jaws, similar to artificial dentures previously worn by the patient.

A set of aluminum splint trays has been designed for this purpose, one upper and one lower, and is made up in three sizes to approximate the average mouth.

When a set of these trays is filled with modelling compound and properly adjusted to corrected models of the mouth, it makes an ideal appliance, which can be worn comfortably by the patient during the healing process. It is sanitary and easily adjusted in the mouth to correct any deformity occasioned by the fractured mandible without causing undue impingement on the mucous membrane. Space is maintained between the upper and lower splint trays by means of two small rubber blocks placed posteriorly, and by a set screw in

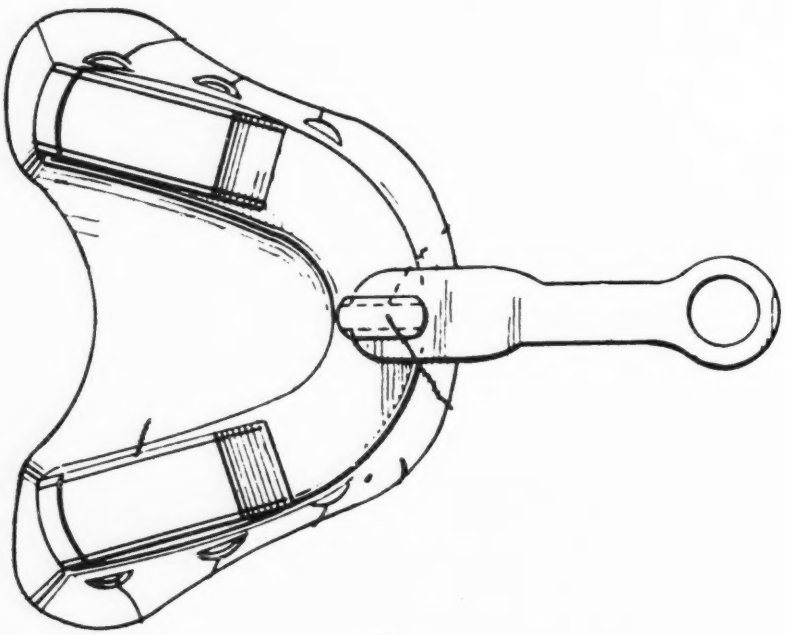


Fig. 4.

the anterior region, which devices restore normal relation of the jaws and also permit feeding of liquid foods without delay.

Technic of Application.—Take a modelling compound impression of the fractured mandible with a suitable lower impression tray, and without any attempt to reduce the fracture. Also take a compound impression of the maxilla in a similar manner and a wax bite in the usual way, the latter mainly referring to the relation of the long fragment of the mandible. After this procedure pour the impressions with plaster to secure the models, which will later be set up on an articulator. The lower model will now show a clear outline of the point of fracture on account of the displacement due to muscular contraction. With a fine hack saw cut through the line of fracture, and, after reassembling the fragments to normal alignment, cement them together again. The corrected models can now be set up on the articulator with the aid of the wax bite to procure normal relation of the jaws. At this time

select proper-sized splint trays to approximate the models on the articulator. Trim the margins of the trays sufficiently to prevent any impingement on the mucous membrane when the trays are finally transferred into the mouth. Fill the splint trays with warm compound and take good deep impressions of the corrected models on the articulator, trimming off all excess compound well up to the edges of the rims. Now close the articulator, and, if necessary, relieve the rubber blocks sufficiently to permit proper relation of the jaws. While holding the splint trays firmly together, twist the ends of the wire ligatures attached to both splint trays tightly and thus, by fastening them securely together, prevent any lateral movement which might cause displacement. The

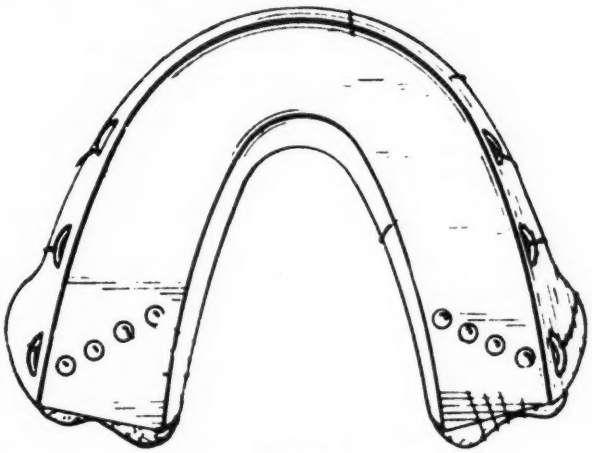


Fig. 5.

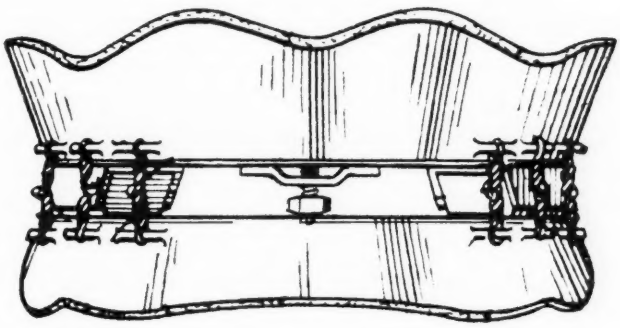


Fig. 6.

splints are now transferred from the articulator into the mouth, and final relation of the jaws can be obtained by adjusting the set screw in the center between the upper and lower splint trays with the removable handle wrench.

In conjunction with the use of this type of splint in the treatment of edentulous fractures, a suitable metal jaw brace should also be applied to the outside of the mandible for the purpose of assisting in the reduction of the fracture, and also in order to furnish support to the mandible as well as to maintain the desired immobilization continuously.

The question of nutrition is equally important. A proper diet of nourishing liquid food should be given the patient every two or three hours, and

should consist of gruels, custards, fruit juices, malted milk, etc. As a matter of precaution, it is advisable for him not to drink or use any other liquids in the mouth warmer than body temperature, as otherwise there would be some danger of distorting the compound contained in the splint trays which forms a part of the splint itself.

Conservative treatment is the most essential consideration in all types of mandibular fractures, as most cases respond successfully to simple immobilization by means of applying interdental wire splints or aluminum splint trays whichever may be indicated.

ABSTRACT OF
CURRENT LITERATURE

NUTRITION AND PEDIATRICS

By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

The Dimensions and Growth of the Palate in the Normal Infant and in the Infant With Gross Maldevelopment of the Upper Lip and Palate. William T. Peyton. Arch. Surg. **22**: 5, 1931.

To quote the words of the author who writes from the Department of Surgery, University of Minnesota, "this study is undertaken with no attempt to prove any expressed opinion as to support a personal theory."

The author, who submitted the manuscript as a thesis, notes that the quantitative growth of the normal palate has been subjected to only superficial investigation. The results of measurements as taken by Alkam, Denzer, Connell, Beuer, Shone and Franke are mentioned. The last-named investigator noted that the length of palate at birth was 26.8 cm. and 52.8 in the adult.

In regard to the controversial subject whether there is a deficiency of tissue in congenital clefts of the upper part of face and jaw, Peyton finds that opinions are based in part or entirely on observation rather than measurement, and that the majority hold that there is not a normal amount of tissue in the cases of cleft palate. On the other hand, Brophy maintained that children with congenital malformation of the palate with rare exceptions have the normal tissue in the palate.

Peyton collected his own data and his material consisted of two groups, 91 normal children and 26 maldeveloped children of approximately the same growth period. In regard to the maldeveloped group with one exception only children with complete cleft of both alveolar process and hard and soft palate were considered.

In commenting on his figures and comparing them with those obtained by others, the author states that although he used different methods of taking these measurements in general there is a similarity of results. Moreover, as has been mentioned by others, he notes that congenital malformation of upper lip and palate are most common in the male sex. In this series 77 per cent of this deformity occurred in boys. Complete right-sided cleft was noted in 35 per cent of his cases, complete left-sided cleft in 38 per cent, and complete bilateral cleft in 27 per cent. In Hang's series of 2,238 cases in which incomplete clefts were included 50.9 per cent had left-sided clefts.

According to the figures of Davis in reviewing a birth record of 28,085 consecutive deliveries, 24 instances of cleft occurred, or once in 915 births of white people and once in 1,788 births in colored people.

In his summary which is here quoted almost entirely, Peyton states that the growth increments of the normal palate during approximately the first year (from 49 to 75 cm. crown-heel length) are as follows:

Widest transverse diameter of palate	5.5 mm.
Actual surface width of palate	8.0 mm.
Height of palate	1.0 mm.
Length of alveolar process	5.0 mm.

The dimensions of cleft palate, except surface area, are larger than those of the normal palate.

According to his investigation, Peyton states that the width of the cleft was found to diminish 1.5 mm. during the growth intervals between 51 and 59 cm. crown-heel length. Furthermore, he states that "this was to be expected after it was found that the widest transverse diameter remained approximately unchanged."

Diphtheria Immunization—The Percutaneous Method of Loewenstein. A. F. Abt and B. F. Feingold. Am. J. Dis. Child. **41**:1, 1931.

Reporting from the Department of Pediatrics, Northwestern University School of Medicine, Abt and Feingold tell of their clinical experiences and immunologic studies with Loewenstein's ointment for immunization against diphtheria.

The preparation contains not only diphtheria toxoid, but also the unfiltered full culture of dead diphtheria bacilli incorporated into an ointment.

Briefly the technic consists in rubbing in a definite amount of the preparation over a certain area of the skin (back, chest, abdomen or arms) after the area is prepared with an application of ether followed by alcohol to remove natural body oils and scales. The rubbing, which usually takes about two to three minutes, is allowed to dry leaving a yellow coating resembling in appearance glue or shellac.

In carrying out this method on 62 children, the authors' procedure was to give the children three rubs at weekly intervals. All these children had a preliminary Schick test which was positive. Six months after the last rub 85 per cent of these children had a negative Schick test, which is practically the same result as obtained by investigators who immunized against diphtheria with injections of toxin-antitoxin mixture.

The authors feel their results are sufficiently satisfactory to justify its use.

Concerning Loewenstein's Active Percutaneous Immunization Against Diphtheria. Prof. E. Nobel. Wien. klin. Wchnschr. **44**:3, 1931.

By means of the Schick test Nobel followed 206 known positive individuals of three distinct groups, of ages from four and one-half years up to eighteen years, who were given three inunctions against diphtheria via the percutane-

ous method of Loewenstein. The procedure, that is one inunction every two weeks, was the same as that advocated by Loewenstein who introduced this method.

Nobel found that six months after the first inunction and five months after the third inunction 111 cases or 65 per cent out of 171 cases remained positive, and only 60 cases or 35 per cent of these individuals had a negative Schick test. As a result of his observation, Nobel is of the opinion that while the Loewenstein method has much in its favor because it is comparatively harmless and simple, yet it is far less effective as compared with other methods of active immunization from the point of view of end-results.

Rheumatic Fever in Childhood. Henry F. Helmholz. Minn. Med. **14**: 1, 1931.

In a brief article which is full of meat, Helmholz makes the rather difficult subject of rheumatic fever in childhood seem simple. Rheumatic fever makes up from 3 to 7 per cent of the medical diseases observed in children's hospitals. Rheumatic fever in childhood is an acute infectious disease, probably caused by a streptococcus and characterized by proliferative and exudative changes in the joints, serous membranes, heart, blood vessels and skin.

Helmholz agrees with most authorities when he states that there appears to be definite familial relationship to the disease.

In regard to symptoms, it must be borne in mind that rheumatic fever in childhood may be monosymptomatic or may show a few or all of the manifestations of the so-called rheumatic cycle.

Usually there is an antecedent upper respiratory tract infection, at times strikingly associated with fatigue followed at a varying interval by high fever, marked perspiration, increased pulse rate and arthritis. In a great many cases there also is evidence of involvement of the heart, and it is important to consider each case of rheumatic fever as possibly carditis until it has been proved definitely that the heart is not involved.

The author states that chorea should definitely be considered as part of rheumatic fever, and not infrequently it is a primary mode of onset.

Based evidently on the experiences of the section on pediatrics, The Mayo Clinic, Helmholz finds the death rate from acute rheumatic fever at between 3 and 5 per cent. The prognosis becomes increasingly bad with each relapse because of the increasing frequency of endocarditis, myocarditis and pericarditis.

According to this authority, the most important part of the treatment is removal of all foci of infection, tonsils in particular, which should be carried out as early as possible after the disappearance of acute symptoms. This should be followed by a long period of rest, varying from six months to a year, in an attempt to effect cure of the carditis and chorea. As it is not possible to determine the changes in the heart during life, such protracted periods of rest seem to be justified.

The Thyroid. Nellis B. Foster. Med. J. & Rec. **133**: 9, 1931.

In a lecture given for the practitioner at New York Academy of Medicine, Foster presents many valuable facts concerning the clinical application of thyroid hypertrophy and thyroid deficiency. It has long been known that goiter is especially common in certain parts of the world, for example, the mountainous areas of Switzerland surrounding Berne, South France, an area in North India, Derbyshire in England. In North America the area is an extension of the Great Lakes district to the Pacific Coast, and the evidence is fairly conclusive that the sporadic cases of goiter are more frequently found in communities where the amount of iodine is scant in the food or water.

The slight thyroid enlargement which develops in young girls and much less often in boys about the time of puberty is merely a hypertrophy or hyperplasia of the thyroid gland, but according to Foster reveals an abnormal sensitiveness and later on in life is likely to be thrown out of balance in the feminine sex by such conditions as pregnancies and menopause and even by menstruation. As small a dose as ten milligrams of iodine daily for a month at six months' intervals is usually sufficient to restore these thyroid enlargements of puberty to normal.

In discussing Gull's syndrome or myxedema, that is, where there is insufficient amount of thyroid secretion, Foster points out that many such cases do not present the classical and well-known picture of myxedema. Physical lassitude, vague muscular pains, headaches, and constipation are some of the more constant symptoms found in individuals having a lesser degree of thyroid insufficiency. These symptoms which are common to many ailments must, however, be supported by other facts, the most significant being a basal metabolism well below the range of normal. Foster warns, however, that occasionally too great significance is attached clinically to the result of the individual's basal metabolism. In early life the arrest of growth and the delay in ossification as evidenced in radiographs are fairly characteristic of deprivation of thyroid secretion in cases suspected of cretinism, which is essentially juvenile myxedema.

Enlargement of thyroid gland, rapid pulse, and exophthalmos are considered the classical triad of Graves' syndrome, but there are many instances in which the disease occurs without a goiter, and less often without an exophthalmos, and occasionally without a rapid pulse. Because of this Foster believes that the disease should be designated as thyrotoxicosis or Graves' syndrome rather than exophthalmos.

There are several valuable leading clinical indications in cases which are less typical of thyrotoxicosis. Among these may be mentioned accelerated pulse and auricular fibrillation, and also mental and physical restlessness associated with loss of weight. Sometimes traces of sugar in the urine is the only significant lead which may reveal that the patient has Graves' disease. But Foster emphasizes the fact that first an elevated basal metabolism and then a lowering of metabolism with change in symptoms following iodine therapy are the outstanding and most reliable clinical symptoms which establish the diagnosis. (In this respect he again warns that great caution must be

exercised in interpreting the results of the patient's basal metabolism.) If the case is one of Graves' disease with basal metabolism consistently elevated well over the normal zone, then it is a fact which has stood the test of experience that if after the use of Lugol's solution for two or three weeks there is a drop in basal metabolism then it may be stated that the symptoms are due to thyroid disorder. It should be mentioned, however, that in many instances, gradually after months, iodine loses its effect. Therefore, in regard to treatment, Foster along with a great many other physicians is of the opinion that removal of the thyroid offers the best prospect, not only of early relief, but also of protection from later recrudescences of symptoms which occur often in spite of competent medical treatment.

Because of such findings as changes in the bones in the nature of osteoporosis, a condition explained by Aub who found a considerable increase in calcium excretion in this disease, Foster mentions an observation which is steadily gaining ground when he says, "It seems entirely probable that we shall eventually discover that every organ in the body is in some measure affected by increase or decrease of thyroid function." This is no doubt another way of stating as he fittingly remarks, "Every endocrine disorder is a polyglandular syndrome and thyroid disease is no exception."

The International Journal of Orthodontia, Oral Surgery and Radiography

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 3523-25 Pine Blvd, St. Louis, Mo.

Foreign Depots — *Great Britain* — Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

Subscription Rates—Single copies, 75 cents. To anywhere in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $7.00 per year in advance. Under foreign postage, $7.40. Volume begins with January and ends with December of each year.

Remittances—Remittances for subscriptions should be made by check, draft, postoffice or express money order, or registered letter payable to the publishers, The C. V. Mosby Company.

Contributions—The editor will be pleased to consider the publication of original communications of merit on orthodontic and allied subjects, which must be contributed solely to this Journal.

Opinions—Neither the editor nor the publisher hold themselves responsible for the opinions of contributors, nor are they responsible for other than editorial statements.

Reprints—The publishers will communicate with authors regarding reprints upon publication of paper.

Communications—Contributed articles, illustrations, letter, books for review, and all other matter pertaining to the editorial department should be addressed to the Editor, Doctor Martin Dewey, 17 Park Ave., New York City. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 3523-25 Pine Blvd., St. Louis, Mo.

Illustrations—Such half-tones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

Advertisements — Objectionable advertisements will not be accepted for publication in this Journal. Forms close first of month preceding date of issue. Advertising rates and sizes on application.

Change of Address—The publishers should be advised of change of subscriber's address about fifteen days before date of issue with both new and old addresses given.

Nonreceipt of Copies—Complaints for nonreceipts of copies or requests for extra numbers must be received on or before the fifteenth of the month of publication; otherwise the supply is apt to be exhausted.

Entered at the Post Office at St. Louis, Mo., as Second-Class Matter.

EDITORIAL

Who Should Control Dental Education?

THE Editorial in the June issue of *Oral Hygiene* under the title of "An Old American Custom" contains some very important thoughts regarding conditions as they exist today. This is especially true in relation to the present tendency of dental education.

If one gives a little thought to the history and development of dentistry, one cannot help but wonder who has been responsible for the development of the dental profession up to the present time. It certainly has not been the group of individuals who are trying to dominate dental education today.

The dental profession developed almost entirely within itself. Educational institutions and medical colleges made no provisions for the education of

the dentist, and consequently the dental profession had to establish independent dental schools. That this plan was successful is proved by the fact that the dental profession, in a much shorter time than was required in the development of any other profession, rose to a point to attract the attention of all individuals.

After the dental profession had attained a certain amount of dignity, standing and usefulness, certain educators concluded it was necessary to save dentistry. Consequently, a movement was begun which had for its purpose the changing of the plan of the education of the dentist, with the result that a certain group of individuals who knew nothing about dentistry as a profession assumed control of the greater number of the educational institutions. Most of these men were professional educators who had no knowledge of the profession as an economical proposition of health service. These men were mostly individuals who obtained salaries from educational institutions. They were not interested enough in dentistry to secure the degree of Doctor of Dental Surgery, as the Editor of *Oral Hygiene* has called attention to. In fact, the majority of them had no qualifications whatsoever to justify them to assume control of the dental profession.

In a recent address made by the chancellor of a large university which has a dental department, said chancellor in more or less of a joking way made a statement which was much truer than he realized. He stated that he saw no reason why he, a professor of Greek, should be addressing a dental audience. There was no reason why he should be, except that he occupies the honorable position of chancellor of the university. As a professor of Greek, he has absolutely no knowledge of dentistry, and has no knowledge of the professional requirements of dental education, yet he dictates the policy of a large medical and dental school.

It is because of this condition that so much unrest exists at the present time in regard to medical and dental education, and also the relation of the profession to the public. Not only have men who are not dentists obtained a percentage of the control of dental education, but we find the activity is being carried into other lines. Men who are not members of the dental profession are trying to dictate the policy of dentistry.

We agree with the Editor of *Oral Hygiene* that the time has arrived when the good old American custom of house cleaning should take place. The first thing that would improve the dental profession would be the removal from dental education of all the men who do not possess a dental degree. The average Doctor of Philosophy without a dental degree is about as useless in the field of dental education as anything that can be conceived of.

"IN MEMORIAM" RESOLUTIONS

J. Lowe Young

Dr. J. Lowe Young who had practiced the specialty of orthodontia in New York City since 1905 died May 23, 1931, of heart disease at his home, 18 West 74th Street.

He was born in Eckford, Middlesex County, Ontario, Canada, February 10, 1868. His early education was gained in the schools of that province, and his professional education at the Toronto Dental College and the Philadelphia Dental College. He graduated from the latter in 1890 and began practice in Montana and then moved to Detroit. He became a citizen of the United States in 1891. He continued general practice for about fifteen years and was during part of that time a member of the faculty of the Detroit Dental College.

He took up the study of orthodontia at the Angle School early in its history and was soon appointed to the teaching staff of that school.

Dr. Young settled in New York in 1905, where his extensive reputation, his great love for children, his unusual skill and his delicate and gentle touch, in spite of a rather remarkable forcefulness of character, brought him in a short time a very great practice.

When the School of Dental and Oral Surgery of Columbia University was organized, he was appointed Professor of Orthodontia, but his health forbade his continuance in that post.

He was married in 1893 to Hester Bateman, a childhood neighbor. She survives him, together with three daughters, two sons, and a grandson.

He has served as President of the First District Dental Society of New York and the American Society of Orthodontists. He was a Fellow of the American College of Dentistry and of The New York Academy of Dentistry, also a member of the First District Dental Society, Second District Dental Society, the New York State Dental Society, the American Dental Association, the Lotus Club and the Delta Sigma Delta Fraternity.

Dr. Young adorned his profession with an outstanding skill and ability and, by the force and vigor of his personality, not only won wide recognition, but stamped indelibly in the minds of the numerous young men whom he trained in his practice the highest ideals of accuracy in their work and service to mankind. He was marvelous in debate, absolutely fearless, never hesitating to call a spade a spade, and the force of his magnificent presence, his well-chosen sentences and the logic and truthfulness of his argument won all hearers.

In the early days of the gold inlay he called the attention of the profession to the fact that a careful carving, in copy of anatomic tooth forms, would not only aid the orthodontist, but materially improve the masticating power

of the patient, and he probably had more influence than any one else in persuading the entire profession to adapt that technic which is now universal.

In his passing, humanity has lost a great soul and the profession a great, powerful, genial, sympathetic friend whose influence in the service of mankind was always in the right direction. That influence will live forever.

WHEREAS, it has pleased Almighty God to remove by death our esteemed and useful brother in the profession, Dr. J. Lowe Young, be it therefore

Resolved, That we the members of the First District Dental Society of New York deeply sense the loss of the valued member whose conscientious services to humanity and the profession had become so great as to make his loss almost irreparable; and be it further

Resolved, That we tender our heartfelt sympathy to the bereaved family and that a copy of these resolutions be spread upon the minutes of our society. Dated, June 4, 1931.

MARTIN C. TRACY
ARTHUR MILLER
WILLIAM A. SPRING
—Committee.

NEWS AND NOTES

American Board of Orthodontia

The following orthodontists have met the requirements of the American Board of Orthodontia and have been issued certificates of qualification by the Board:

E. B. Arnold, Houston, Texas
E. Santley, Butler, New York City
Robert Dunn, San Francisco, California
Joseph D. Eby, New York City
Walter H. Ellis, Buffalo, New York
Adelbert Fernald, Boston, Massachusetts
Henry C. Ferris, New York City
D. Willard Flint, Pittsburgh, Pennsylvania
George W. Grieve, Toronto, Ontario
Russell E. Irish, Pittsburgh, Pennsylvania
Earl G. Jones, Columbus, Ohio
Harry C. Metz, Pittsburgh, Pennsylvania
Stephen A. Moore, London, Ontario
John R. McCoy, Los Angeles, California
H. C. Pollock, St. Louis, Missouri
Homer B. Robison, Hutchinson, Kansas
Walter S. Sargeant, Toledo, Ohio
Paul G. Spencer, Waco, Texas
Ralph Waldron, Newark, New Jersey
Raymond L. Webster, Providence, Rhode Island
Percy Norman Williams, Tucson, Arizona

Respectfully submitted,
OREN A. OLIVER, Secretary.

American Society of Oral Surgeons and Exodontists

The thirteenth annual meeting of the American Society of Oral Surgeons and Exodontists will be held in Memphis, Tenn., October 16 and 17, 1931. The Elks Hotel will be the headquarters for the meeting.

HOWARD C. MILLER, Secretary,
55 E. Washington Street,
Chicago, Ill.

American Dental Assistants Association

The seventh annual meeting of the American Dental Assistants Association will be held in Memphis, Tenn., October 19 to 22, 1931.

RUTH F. ROGERS, President,
223 W. Jackson Blvd.,
Chicago, Ill.